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(54) **Electronic document approval system**

Elektronisches System zum Genehmigen von Dokumenten

Système électronique pour approuver des documents

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- **PATENT ABSTRACTS OF JAPAN, vol. 6, no. 206 (P-149), 19th October 1982; & JP-A-57 111 648 (TOKYO SHIBAURA DENKI K.K.) 27-12-1980**
- **PATENT ABSTRACTS OF JAPAN, vol. 7, no. 2 (P-166), 7th January 1983; & JP-A-57 161 969 (FUJITSU K.K.) 30-03-1981**
- **COMPUTER JOURNAL, vol. 26, no. 1, February 1983, pages 52-59, Wiley Heyden Ltd, London, GB; N.H. GEHANI: "High level from definition in office information systems"**

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Description

Field of the Invention

This invention deals with approval on contents of electronically generated and mailed documents and with a system for generating, monitoring and processing said documents.

Background of Invention

Electronic mailing systems are now currently used within an increasing number of companies. Such a system enables users to exchange very quickly a lot of information using simple notes or more elaborate documents.

But documents which must be signed or approved are in most cases handled the archaic way. So every step in the process involves human intervention. The originator of the document must have a copy of the form. He gets copies of form from central stores which have to be administrated. Often he keeps copies for later use and risks using an outdated version of the form. When filling-in the form very little help is available and of course no error checking can be done. The form can often be confusing and difficult to complete, because cost considerations lead to the creation of multipurpose forms which can be used in all instances. A more elaborate form filling system has been disclosed in European application No. 0,269,875 wherein shell forms are processed.

Once the form is completed, the originator has to get it approved. The approval process can be simple (for instance approval by the originator's manager), in that case, a simple electronic mail forwarding operation would do the job.

But in most instances the requirements are more complex and several levels of management or functional approvals may be required, e.g. by a Financial Analyst, a Budget Controller, etc... Often the approval process depends on data filled into the form: e.g. for a purchase order if the amount of a purchase requested doesn't exceed a given value, one level of management is sufficient, otherwise two levels of management are necessary, for instance. Also because of management decisions, approval rules for a given form can be changed without the form itself being changed.

With a conventional system, when the originator passes the document to the first approver (e.g. his manager) to get his signature (i.e. approval), he has lost control of it. He cannot be sure where the document is or who has it or if the document is hand carried or forwarded through internal mail. This prevails for any step in the approval process: first approver looses control upon transferring the document to the second approver and so on. Often approvers have to keep a paper copy of the document before passing it to the next approver.

In some instances approval has to be given by a delegate, but people may not know who the delegate is.

The approver list may also need to be modified during the approval process : an approver can be replaced by his manager, the order of approval can be changed or more information may be requested by an approver from another approver who has already signed.

Finally, all documents issued from forms and approved reach the person or the department who has to process and execute the request. First, checking must be done : data checking and approval process checking.

Then, if all is correct, action is taken such as keying the data into an operational system.

Generally, no information is returned to the originator. He has to wait until his request is satisfied, or he has to get information by phone or mail.

The document are to be kept not only during all the time the involved approval process is running, but also after that, during a retention period fixed for each form.

Disclosed in the Patent US-A-4,503,499 is a system wherein a specific user, i.e. a so-called "effort manager" is assigned to define a route specification and enter corresponding data into the computer system. While disclosed in Patent Abstracts of Japan, Vol. 9, No 206(P/149), of October 19, 1982, is a system wherein the document meant to receive approval by circulation is inputted together with circulation order facilities.

All known systems, however, lack efficient means for monitoring filled-in forms (herein referred to as documents), then computing fully dynamically and electronically the specific and correct approval path to be followed by each considered form based on its contents when filled-in, with reference to predefined sets of approval rules to be combined with varying titles or hierarchical positions of respective users to be automatically selected within the system users population, and controlling said path as well as filtering any user's request for access to filled-in documents based on the requestor's function within the user's organization.

Summary of the Invention

One object of this invention is to provide a system for accessing a prestored blank form library, selecting a form, filling-in said form, computing an approval path based on filled-in form data and on specific predefined approval rules referring to user's job or function within the population of system's attached users, and monitoring and controlling the corresponding approval operations.

Another object of the invention is to provide a system for filtering any request for access to any filled-in form (document) based on filled-in data, stored updatable approval rules and requestor's identity.

In other words, this invention addresses the automation of all the steps involved in the processing of documents whose contents require complex approvals.

That includes documents origination, approver list determination, electronic signatures (i.e. approval) authentification, finalization operations, storage and general follow-up of the process.

More particularly the invention, as claimed, addresses an approval system for controlling the processing of a user originated document requiring electronic approval by system selected users, in an electronic mailing system including terminals attached to a digital network, virtual machines (VM) including computer means, memory and software facilities assigned to individual users, each user being assigned a job or function within the population of system attached users, and means for generating processing and monitoring electronic documents to be mailed from any terminal to any user, said approval system including:

- means for storing and updating function tables wherein each system user's function and address are identified;
- means for storing document forms;
- means for storing predefined approval rules based on user function document type and document forms contents;
- terminal controllable means for selecting, accessing, filling-in, processing and mailing any selected form whose contents is to be subjected to approval;
- means sensitive to said mailing for addressing said function tables and, based upon said approval rules, for determining the approval path among the system attached users; and,
- means sensitive to said approval path determination for monitoring the mailing and processing of said filled-in form accordingly.

These and other objects, characteristics and advantages of the invention will be explained in the following with reference to the attached drawings.

Brief Description of the Drawings

The figures attached respectively represent:

Figure 1: digital network wherein the invention would be implemented.

Figure 2: portion of a network of Figure 1.

Figure 3: a basic system architecture for implementing this invention.

Figure 4: a flow chart for the invention.

Figure 5: a software architecture for the invention.

Figure 6: a symbolic representation of the invention.

Figure 7: a mapping of system tables to be used with the invention.

Figure 8: a document structure

Figure 9: a flow chard for accessing documents processed with the invention.

Figures 10-13: mesure oriented charts for operating the invention.

Figures 14-17: detailed flow charts of the invention operation.

Figure 18: a table to be used with the invention.

Description of the Preferred Embodiment

Represented in Figure 1 is a digital network node including both application resources and communication resources. Terminals T1, T2, ..., for instance IBM 327X or 317X, i.e. intelligent displays, are attached to a host computer (IBM 3090) either directly, or through a concentrator or Communication Controller (IBM 3725) or a "Private Branch Exchange (PBX)" for remote terminals. Several similar nodes are connected into a digital network leading thus to thousands of terminals attached to the network. Users sitting at any terminal can both perform selected tasks using the network software resources, and communicate with each other at will, day and night, by simple keyboard operations.

Let's assume the system including the host computer is operating in a VM/SP environment. Each person, or end user, is assigned a Virtual Machine (machine) in the computer system within a given node of the network. Virtual Machine means in fact a predetermined size memory location sometimes referred to as user's A-disk and means to share common computer hardware and software resources, essentially including the IBM Control Program (CP) and Conversational Monitor System (CMS), each including its own types of services. CP manages system resources and provides an individual working environment for each person using the system. Resources managed by CP include: Processor functions; processor storage and input/output devices. CP creates the system work environment. It controls the system resources that are available to the user during a work session.

CMS, although a component of VM/SP operating system, is itself an operating system running under CP. As the name "conversational" implies, there is a two way communication between the system users and CMS.

For more detailed information on IBM CP and CMS one may refer to the following IBM documents :

- Virtual Machine/System Product (VM/SP) General information, GC20-1838.

- Virtual Machine/System Product : CMS USER's Guide, SC19-6210.

- Virtual Machine/System Product : System Product Editor User's Guide, SC24-5220.

As illustrated in Figure 2, a user may initiate a session using any of the terminals attached to the network, and through a logon procedure reach his/her machine. Logging-on means sending an interrupt command from the keyboard to reach CP facilities and then identifying himself (herself) to the system by typing a personal identification code (userid) and in most cases a password. Password use enables forbidding access to a given "machine" by anyone but the machine "owner". Passwords are secret and known to the sole owner. Then CMS resources and/or any other software resources (e.g IBM "Professional Office System (PROFS)" application programs) and/or any other specific software, such as the one designated here by "SEALING" designed for this invention, may either be accessed on request or be accessed directly. This is defined in the user's PROFILE EXEC routine tailored to identify the available resources assigned (i.e. made available) to the specific user upon originally defining the user's machine. For more detailed information on IBM PROFS one may refer to the following IBM documents:

- Using the Professional Office System (Order No. SH20-5604)

In addition, for the purpose of this invention, a specific environment has been tailored within the system as represented in Figure 3 showing details of the so called "SEALING" environment. Said environment includes a data base machine (SEALDBA) and a system machine (SEALSYST) in addition to user's VM machines.

SEALDBA is a virtual machine running in disconnected mode as a "Structured Query Language/Data System (SQL/DS)" data base administrator machine. Attached to the SEALDBA machine are several mini-disks operating in a read/write (R/W) mode :

- an A-disk only used as working disk for maintenance operations;

- a Directory disk containing the data-base directory;

- a Log-disk which supports logging of all the work units and allows rollback in case of problem; and,

- several Data disks : at least one for common system tables, and as many as required by different forms supported (document/form meaning will be defined further). The SEALDBA machine may be considered an SQL machine essentially including the data bases in SQL form.

SEALSYST is the SEALING system virtual machine. Attached to this machine are several mini-disks :

- an A-disk only used as working disk for maintenance operations;

- a Batch-disk to support Batch operations;

- a Source-disk which contains the source of all the programs; and

- a System-disk which contains all necessary routines for a user to run the SEALING application, i.e. routines needed by the approval application and further defined in this description. When a user wants to run the application, he has to make a read-only link to this minidisk.

The USER'S VIRTUAL MACHINE is a standard VM machine with a memory size of 2 Meg and a user's A-disk. A-disk is mainly used to store documents drafts and to support print operations.

Both, the standard user's VM machine and the SEALSYST machine may communicate with the SQL/DS data base administrator machine via Inter User Communication Vehicle (IUCV Link).

This system architecture provides several advantages which will be made apparent in the following description. But, it may already be stated that it contributes to provide a higher security level to the approval process. To that end, the only SQL commands the end user may use are predefined into access modules stored into the SEALDBA machine attached disks. The IUCV link enables accessing and running these modules, and only these modules, from the user's terminal.

To simplify understanding the detailed description of the preferred embodiment, one may first note the following assumptions. Unfilled (blank) forms have been designed and stored in the system (SEALSYST) for further use and conversion into documents to be processed (e.g. approved) using the invention.

Approvers are normally designated by reference to their function, e.g. manager first, second, ... line of department No. xx. The function may be delegated, in which case the "acting" person would be different from the original assignee (titular) of the function.

When the system user (originator of a considered document) wishes to forward the document for proper approval, the approval path is dynamically computed using the contents of specific data fields within the document, and predefined approval rules. In the following implementation, the approvers may have been split into two categories : "Authorizers" and "Reviewers". Only an authorizer may accept (concur) or reject a document. A reviewer can only give an advice. A negative reviewer's opinion requires a subsequent authorizer approval for the document to proceed.

Finally, after being processed by the last approver, the document is forwarded automatically to a finalizing VM machine performing conventional operations such update, format and if required encrypt and send through the network to another network node, and, for the purpose of this invention, perform a control operation tailored to ascertain a higher security level to the approval system.

The above operations are summarized in Figure 4, using the facilities made available through SEALDBA, SEALSYST as well as the VM user's machine.

It should be noted therein, that the document as well as any information (e.g. functions) required for approval are not forwarded from one approver to the next. They are accessed from the general data base dynamically. This architecture enables updating constantly the approval path to the company's personnel (users) moves or reassignments.

From a functional standpoint the software architecture is organized as represented in Figure 5. In other words, access to the approval system is provided by software tools in "Restructured Extended Executor (RSXX)" language. These tools (programs) will access the library of SEALING General Purpose Programs as well as access a Dialog Manager. The Dialog Manager in "Interactive Structured Programming Facility (ISPF)" language controls the following functions: screen display on any users terminal; tables in memory; and messages generation. The dialog manager performs the tasks of a user interface. For reference on ISPF one may refer to the IBM brochure ISPF Version 2 Dialog Management Services SC34-2173. Accesses to said dialog manager are performed by the entry REXX unit and by the general purpose program unit. A Data Base Administrator is provided which contains SQL/DS tools to select; update; insert or delete data from a DATA BASE stored on disks. Said Data Base Administrator is accessed by the General Programs using SQL orders. For SQL, one may refer to :

- SQL/Data System General Information GH24-5064

- SQL/Data System Terminal User's Guide SH24-5045

Represented in Figure 6 is a symbolic representation of the approval system centered on an SQL/DS data base accessible on Read/Write basis throughout the process. An entry for a document preparation (as will be explained later) involves read/write operations into the data base. This process step is followed by an approval step which can be triggered from both the document preparing user or directly from an approver. Once approved the document is

further processed, followed-up and executed as needed. For that purpose not only the SQL/DS needs be accessed, but external systems too, like, for instance VM directories otherwise available. The document is finally forwarded to storage. Also available are means for updating "function" data particularly useful to the approval process; and consulting/analysis means to be used for instance for performing statistical operations.

Represented in Figure 7, is a mapping of the system data to be stored into the data disks of the SQL oriented data base of SEALDBA machine.

System data can be split into general tables required to run the system and specific tables which are accessed and/or generated when needed by the approval process. Obviously, the contents of said tables are based on preselected approval criteria which could be changed and therefore are not limitative. The following description is made with reference to criteria implemented in the preferred embodiment.

(A) In General Tables, one can find:

1. The LOGON tables including users identification data, (e.g. nodeid; userid).

2. Tables related to FUNCTIONS : it is herein assumed that the approval system users are assigned specific functions governing the approval rules (e.g. managerial organization). Said tables include :

- FUNCTION tables defining existing functions and providing for each function an acting person and a titular person identification.
- PREVIDEL tables registering previsions of delegations, assuming approval competence could be delegated from one person to another.
- HISTFUNC keeps track of any modification occurring in function tables for audit purposes (new function, delegation, change of titular).

3. Tables related to APPROVAL process :
APPFUTU, APPWAIT and APPDONE relate to documents in progress.

- APPFUTU contains for each document the functions to be involved (in the future) in the approval process.
- APPWAIT contains for each document the functions awaiting for an action on the document.
- APPDONE contains for each document the functions having already acted on the document, the decisions and identification of the person(s) who acted and the titular if different.

APPHIST deals with documents which are no more in progress, i.e. they have been finalized, rejected or cancelled. It has exactly the same structure as APPDONE.

4. Tables related to DOCUMENTS :
Filled-in forms provide so called documents to be subjected to the approval process. Each document includes at least a HEADER with the data defining the document. All headers are dynamically stored into HEADERS tables. COMMENTS Tables contain for each document the comments added by the approvers during the approval process as they act on the document.

(B) In the specific Tables, one can find :

1. Tables dealing with FUNCTIONS :

- determination of function table coded FàfuncDn;
- characteristic of function table coded FàfuncCn.

(func is a code for type of function and n in Cn and Dn is an integer sequence number).

2. Tables on DOCUMENTS :
Typdocàn represents for a given form (or type of document/typdoc) a set of n tables needed to contain the specific document data.

Control tables are sometimes necessary to control the data entered to prepare a document or to modify these data during approval process. Once defined and updated, they can be used for several different types of documents.

Follow-up tables are sometimes necessary to give follow-up information on definitely approved documents.

An example of Function Table is represented hereunder :

FUNCTION TABLE

	Function Type (Typfun)	Function Reference (Reffun)	Acting Userid	Acting Node	Titular Userid	Titular Node	Last update	Delegation Index
1	INDI	079954	MARTINS	LGEVM2	MARTINS	LGEVM2	880513	
2	INDI	071328	DAVIS	LGEVM2	DAVIES	LGEVM2	880622	
3	INDI	055413	HACKERS	LGEVM2	HACKERS	LGEVM2	881130	
4	MANA	0793	MARTINS	LGEVM2	MARTINS	LGEVM2	880524	
5	MANA	0830	MARTINS	LGEVM2	DAVIES	LGEVM2	880515	D
6	ISPC		JONHSON	LGEVM2	DAVIES	LGEVM2	880318	D
7	PURC	45	HACKERS	LGEVM2	HACKERS	LGEVM2	880513	
8	INDI	022007			ROOVER	LGEVM2	880913	
9	MANA	0750			ROOVER	LGEVM2	881213	
10	MANA	1000	ANDERSON	LGEVM2	SCHMIDT	DCTVM1	881024	S
11	INDI	045345	ANDERSON	LGEVM2	ANDERSON	LGEVM2	881012	
12	INDI	087632	JONHSON	LGEVM2	JOHNSON	LGEVM2	881103	

An important concept of the system is the concept of "function". In a company or any group of people within which the approval system is needed to operate, prerogatives, e.g. approval competence, are assigned based on job assignments or title, herein referred to as "Function".

In an approval process, it is not the signature of a specific person which is required, but the signature of the person presently assigned the required function.

A function can be defined as a sum of prerogatives acknowledged by the company and assigned to a person. Conversely, a given person may have several different functions.

The approval system of this invention considers functions assigned rather than people. There are a lot of advantages to use this criterium because functions are generally more stable that people. For instance, approval rules defined in a company are generally related to people's level within the company (hierarchy).

In the system, a "function" is completely defined by :

- a type of function (Typfun): herein coded with four characters
  - Manager (MANA)
  - Budget Controller
  - Financial Analyst
  - Purchaser (PURC)
  - .....
- a reference of function (Reffun): coded with six characters

- Managed department number for Managers
- Code for Financial Analyst
- Code for Purchaser
- .....

When a function is unique, reference is not necessary. For example, the function "Plans & Controls" is unique.

The function "employee" is a basic function meaning being one of the company's employees. Its reference can be the serial number assigned to the individual at hiring.

The type of function has been codified with 4 characters :

- INDI is for "Employee"
- MANA is for "Manager"
- PURC is for "Purchaser"
- CTLG is for "Controller"
- ISPC is for "Plans and Controls" .....

Userid and nodeid identify a VM machine and consequently a unique person.

"TITULAR" designates the owner, i.e. the person who is assigned the function while "ACTING" is used to designate the person actually doing the job presently.

For instance MARTINS is the employee whose reference number (Reffun) is 079954 (line 1). He is also manager of the department number 0793 (line 4). He is acting as manager of department 0830 by delegation of DAVIES (line 5) who is employee number 071328 (line 2).

HACKERS is employee number 055413 (line 3) and also Purchaser code 45 (line 7).

DAVIES has delegated his function of manager to another manager, MARTINS, as seen before, but he has delegated his function of Plans and Controls to JOHNSON who is not manager (line 6).

ROOVER (line 8 and 9) is absent (and nobody is acting for him).

SCHMIDT is not on the same node and has no electronic signature system, so ANDERSON is in charge of entering his decision in the system. He acts as "substitute" for SCHMIDT (delegation index is S).

Some functions are already managed in specialized systems attached to the network. In that case, a link to the specialized system will enable getting rid of the hassle of the Function Table maintenance. For instance in a Company, a Personnel Department System provides indications of titular for the following functions:

- employee (referenced by his employee Serial number)
- department manager (referenced by managed department number)

The system provides an interactive means to manage any other function, as soon as this function becomes necessary in an approval process.

Examples of APPROVAL TABLES of Figure 4 are represented hereunder.

APPROVAL TABLES

APPFUTU:

Document Type (Typdoc)	Refer. (Refdoc)	Function Type (Typfun)	Refer. (Reffun)	App. type (AppTyp)	Mand tory (MCS)	Order
DAFONC	0JA54	MANA	0798	A	M	1
DAFONC	0JA54	MANA	0792	A	M	2
DAFONC	0JA54	CTLG	LGE	A	M	3
DAFONC	0JA54	PURC	45	R	M	4
DAFONC	0JA54	PURC	74	R	M	4
.....	.....	....	..	.	.	.

APPWAIT:

Document Type (Typdoc)	Refer. (Refdoc)	Function Type (Typfun)	Refer. (Reffun)	App. type	Mandatory	Previous approver name
DAFONC	OJA54	MANA	0793	A	M	Johson, Alex
.....	.....	....	....	.	.	.....

Comments for previous approver	In wait since Date	Time
OK for me	881023	153407
	.....	.....

APPDONE:

Document Type	Refer.	Function Type	Refer.	App. type	Mandatory	Decision	Acting Emp N°	Name
DAFONC	OJA54	MANA	0732	A	M	Y	079954	Schmidt, John
.....	.....	....	....	.	.	.	.....	.....

Titular Emp N°	Name	Deleg Index	Action on Date	Time
071328	Davies, Philip	D	881023	153207
.....	.....	.	.....	.....

APPHIST : same structure as APPDONE.

APPFUTU : contains for each document in the approval process the list of functions which will have to deal with the document later on.

In this table the document is uniquely identified by the type of document (typdoc), which is in fact the code for the form from which the document is derived and a reference (refdoc) within this type. In this application, one should remember that the expression "document" should normally mean a filled-in form, and that several prestored forms will be available.

The function is identified as mentioned previously in FUNCTION table by a type of function (Typfun) and a reference number (e.g. Service or Department number (Reffun)). An order number 1, 2, 3 ... indicates which function(s) will need to approve next, assuming no changes to the approver list has occurred. Several functions can have the same order number.

Approver type (Apptyp) indicates if the function is in the list as an Authorizer (A) or as a Reviewer (R). The Authorizer actions could be "Authorize" or "Reject"; while a reviewer should "Approve" or "Disapprove".

An index indicates if the function is mandatory or not on the approver list. This will be important to make changes in the approver list. If the function is not mandatory, any approver can suppress it, but if it is mandatory, either it is not possible to suppress it, or another function must replace it.

APPWAIT contains for each document in approval process the function(s) which are actually waiting for the document (i.e. next to act).

As APPFUTU, it contains document identification, function identification, approver type and mandatory indicator.

It contains also the previous approver's name, one line personal comments from the previous approver, the date and time of previous action.

APPDONE : contains for each document the functions that have already acted on the document, the decisions and identification of the persons who have acted and of the titular if he is different.

As APPFUTU and APPWAIT, it contains document identification, function identification, approver type and mandatory indicator. It contains also the decision of the approver Y for Authorize or Approve; N for Reject or Disapprove, the identification of the approver, name and employee serial number, the identification of the titular of the function, name and employee number, the delegation indicator, the action date and time.

As already mentioned, the approval system for the best mode of this invention is made to use predesigned forms. Any user wishing to start a request for approval operation, will access a document form (blank)and fill-it in. A form includes predefined fields which, when filled-in will be stored into a set of tables including, among others, a table "HEADERS".

HEADERS

Document Type	Refer.	Status	Flag	Originator Type	Refer.	Emp no	Name
DAFONC	0JA54	P	N	INDI	079954	079954	Schmidt, John

Subject of the document	Created on Date	Time
Bus transportation for kick-off meeting	881023	153407

This table contains header data required for any document.

The key of this table is the document identification, i.e. type and reference of document. Each document is assigned a status (one character) which can be :

- P : document is in progress in approval process
- F : document is finalized, approval process is over.
- S : document has been sent to an operational system
- T : document has been transmitted for action (acknowledgment received from operational system).
- H : action involved is terminated
- R : document has been rejected by an Authorizer
- C : document has been cancelled by the Originator

A flag is used to indicate that the corresponding document is currently being processed by someone. If the flag is set to Y (yes), the system bars someone else's access to the document.

The Originator is identified in HEADERS table by his function (e.g. INDI for employee), his employee serial number and his name.

The table also contains the subject of the request submitted to approval (document) and the originating date and time.

In addition to the function tables already mentioned the system will use Specific Function Tables storing data to be used for defining the approval rules selected by the form user's company.

SPECIFIC FUNCTION TABLES

DETERMINATION TABLE: (D) = FàfuncDn wherein "func" is used to designate function type.

Key	gives:
Parameter	Reference of function

Example: FàMANAD1

Project Number	Responsible department (reference for Function Manager)
4577310	0793
4012306	0755
.....	....

CARACTERISTIC TABLE: (C) = FàfuncCn

Key	gives:
Reference of function	Parameter(s)

Example: FàMANAC1

Department of manager	Expense authorizations Personal	General	Investment	Last update
0793	10000	20000	15000	881022
0755	25000	50000	35000	871231
....	.....	.....	.....	.....

These tables allow retrieving a function reference from a parameter. They will be used during approver list determination.

The example shows so called Determination Tables useful to determine the manager who is responsible for a documented project.

Function CHARACTERISTIC tables enable determining parameters from the reference of a given type of function. They will be used during approver signature validation. In other words, these tables store predefined approval rules.

The example shows the amount of expenses authorized based on the considered manager's function and the

company's selected rules setting expense thresholds.

From the above considerations, one may understand that any filled-in form (=document) contents is dynamically used by the system to determine the approval path when considered in combination with approval rules. In addition, the system is designed to enable adding or modifying forms, as needed, in a fairly simple way. Therefore, the various types of information fields contents should be organized to enable convenient processing of said fields. To that end, each field contents for all filled-in forms is stored in a document table, and these various tables are made to be related to each other according to a predefined tree structure (see Figure 8).

If the form is simple, its data can be contained in one single table typdocàl for the document (TOP) data table (NB: "typdoc" is used to designate document type and corresponding form code).

If the form is more complex, tables typdocà2, typdocà3, ..., typdocàn can be defined to contain data which are dependent and have a variable number of occurrences. These tables will be related to each other according to the mentioned tree structure.

To illustrate the above, a specific example (General Expenses Purchase Request) is shown hereunder.

Table 1

Header of Purchase Request		
Keys :		
KEY1	CHAR(5)	Reference of request
Non-key variables :		
PROFI	CHAR(7)	Project to be charged
MAUTO	DEC(11,0)	Maximum amount
.....	.....	.....

Table 2

Items inside Purchase Request		
Keys :		
KEY1	CHAR(5)	Reference of Request
KEY2	SMALLINT	Item number
Non-key variables :		
QTDEM	DEC(7)	Requested quantity
FPUHT	DEC(9,2)	Estimated unit price
DESC	CHAR(30)	Item main description
.....	.....	.....

Table 3

Complementary description of an item		
Keys :		
KEY1	CHAR(5)	Reference of Request
KEY2	SMALLINT	Item number
KEY3	SMALLINT	Line number
Non-key variables :		
DESCC	CHAR(30)	Complementary description line

Having defined the system organization, one may now understand the principles used for any user's access to a document (see the flow chart of Figure 9).

First, the user is recognized for being logged on a virtual machine which the system knows as a "signature" (approval) machine assigned to a registered user.

The FUNCTION table is the main filter to access the documents. Said table is permanently updated to reflect the

actual function of all users attached to the network. Once authorized access by the filter, the table to be used by the system depends on what the user wants to do :

- APPWAIT is used to determine the documents awaiting the action.

- HEADERS is used to find documents origins.

APPDONE or APPHIST are used to find documents on which action has been taken already. Documents partially approved are stored in table APPDONE, while those approved by all required approvers (or rejected) are stored in an APPHIST or historic table.

To make the system attractive and end-user friendly from an operational standpoint, panels have been set and functional keys (PF keys) assigned specific tasks.

The system does not assume any level of technical knowledge or expertise. It does assume however that the user is somehow familiar with document processing tools presently available; e.g. IBM PROFS or a similar Office System. More generally speaking the system is menu driven as will be shown hereunder on implemented examples.

First, the system is accessible by typing a CMS command through the user's terminal (e.g. typing "SEALING"), which links the user's VM machine to the SEALSYST VM system-disk. Assuming the IBM PROFS system is available, then a PF key would have been customized for direct access to the system. In both instances, the system would load programs (EXECS or routines) for preparing, processing or consulting, etc... documents, and presenting the following menu on the user's display.

```
          ---------- SEALING MAIN MENU ----------

Press one of the following PF keys

PF1       Prepare a document
PF2       Process documents awaiting your action
PF3       Consult documents you have originated or acted upon

PF5       Look at documents awaiting someone else's action

PF7       Delegate or retrieve your authority
PF8       Transfer or retrieve your VM Userid and Password.


PF9  Help    PF12  Return
```

The user may select one of the options by depressing the PF key associated with said option. For example, to Prepare a Document, the user should press PF1.

He can also press PF9 to get a Help screen and that is the case for all the panels displayed in the system. PF12 enables quitting the system.

If the user presses an unused PF key, for instance PF4, an error message is displayed at the bottom of the screen, just above the PF keys description line.

Obviously the first operation a user needs performing is selecting a prestored form and filling said form in, to prepare a filled-in form, i.e. a document.

Depressing PF1 on menu 1 calls PREPARE EXEC. (See Fig. 10 for a high level flow chart of the process for preparing a document to be submitted to approval).

This EXEC starts displaying the list of forms available to the user in a "Choose a Form Category" menu. It should be noted that the system is made to process forms of various categories like "purchasing" orders (APPR), "financial" orders (FINA), requests for getting approval to tailor a VM Machine to a new user (LOGO), etc...

```
---------- Choose a Form Category ----------

Press the PF Key for the Form Category you want to Choose.

PF1       Purchasing forms                                  APPR
PF2       Logon request forms                               LOGO
PF3       Financial forms                                   FINA



PF9  Help    PF10  Next    PF11  Previous    PF12  End
```

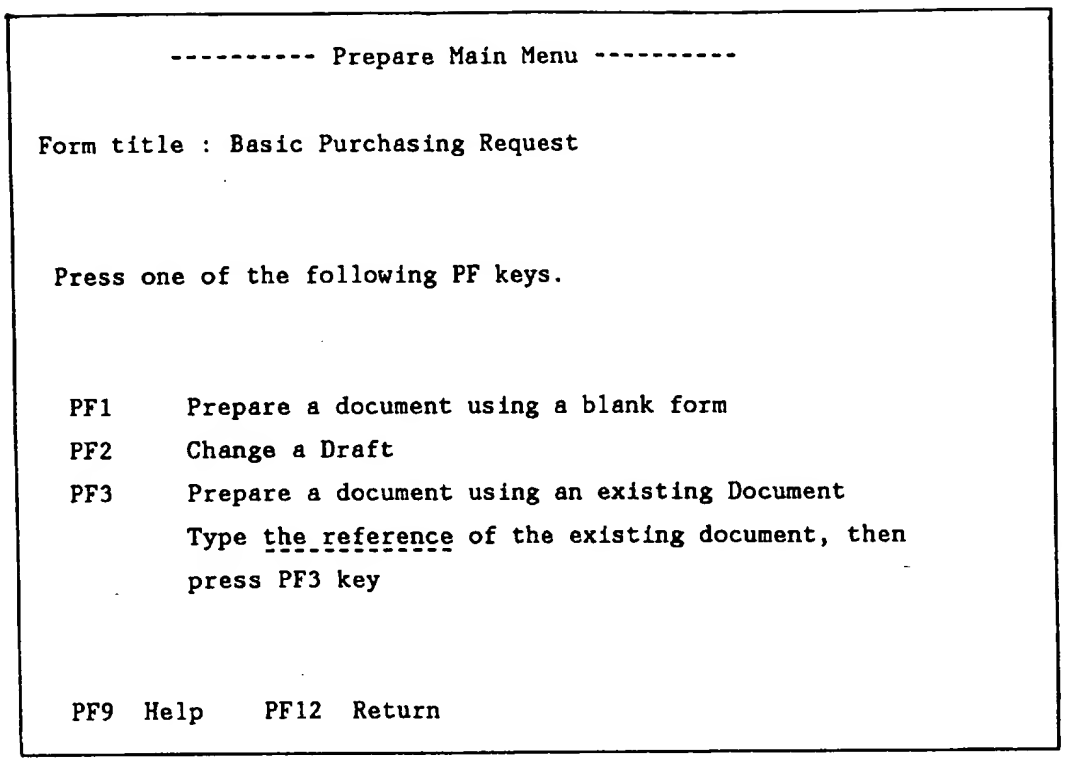
If there are too many categories to fit on one screen, the user can scroll up and down using PF10 and PF11 respectively through the list to find the right category. Once a category is selected, a list of available forms within the category is displayed.

For example, if "Purchasing Form" has been chosen, the following "Choose a Form" menu is displayed.

```
--------- Choose a Form ----------

Press the PF key for the Form you want to choose.

PF1       Basic Purchasing Request                          DAFONC
PF2       Request for Price and Delay Quotation             DEMPED

PF4       Request Order                                     BORDRE



PF9  Help    PF10  Next    PF11  Previous    PF12  Return
```

The user may select the form which fits his present need. Help screens can be displayed at user's request and explain in which circumstances each form must be used.

Suppose the user presses PF1 on this menu. The menu below is then shown (assuming the requestor is the function owner and therefore his function has been allowed access to this kind of form).



The user may select one out of three methods to prepare a document:

- PF1 Prepare a document using a blank form. A predesigned form which includes input zones containing blank fields to be filled-in or already filled-in by "default" data which could be amended by the user at will.
- PF2 Change a Draft. The user is shown a list of drafts of that form he has previously filled-in or just begun to fill-in and stored without sending as a document.
- PF3 Prepare a document using an existing Document : the user has to type the reference of a document he is allowed to access and the system builds a new draft copying the data of this document. The system checks in this case that the reference exists in the data-base and that the user is either the originator, or one of the approvers. Thus filtering access to said existing document.

The layout of the screens which the user is presented with, depends on the original form designer's choices. For example, if the form "General Expenses Purchase Request" has been chosen the screen below is shown.

```
------ General Expenses Purchase Request (Header) -----

Subject : Transport by bus

Addressee                 : DUPONT   Department: 0693
Confidential Information  : N (Y/N)  PC parts or softwares : N (Y/N)
                                     New chemical product  : N (Y/N)

Project to be charged     : 582310
Maximum amount (FF)       : 1000     Total  :  1000
Expiration date (JJMMAA)  : ..... (optional)

Cmd = X (Select),D (Delete),A (Add),R (Repeat) PF8 Next PF7 Previous
-------------------------------------------------------------------
Cmd Item Description              Quantity   Unit price   Delivery
                                                          week

  -   1   transport by bus 40 places   1          1000      22 / 88
          Vence-La Gaude on xx/xx/xx
-------------------------------------------------------------------
 PF1 Search    PF5 Submit    PF9 Help    PF10 Next    PF12 File
```

The user can fill-in here the "header" part of the form.

All forms have a SUBJECT field. The "SEALING" system of this invention will use this field when showing the document on a list of documents. For instance when showing the list of documents awaiting someone's action.

Some data have already been filled-in (default) and can be modified :

- The addressee (originator) and his department.
- The flag "Confidential Information" indicates that confidential information are to be given to the supplier.
- The flag "PC parts or softwares" indicates if the request contains such parts.
- The flag "New chemical product" indicates if the request contains a new chemical product.

Some data are mandatory; like for instance the subject, and the project to be charged.

Some data are retrievable by the system for user's convenience. That might help for instance by enabling consulting the list of projects ran by the company's department the involved system user belongs to. Therefore, search is available for the project "field".

If the user sets the cursor on this filed and presses PF1, he will be asked for a department number and the system will display the list of projects for that department. The user can choose one of these and the field of the request will be automatically filled-in with the chosen project.

When the header is filled-in, the user has to fill the remaining items. He can press PF10 to get the item panel. When one or more items are entered, he will be able to select one item by typing X in front of it; or to repeat, delete or

add a new item by typing R, D or A.

Depressing the ENTER key or any PF key, triggers a trivial data checking. If any checking fails, the required action is not performed, an error message is displayed, the cursor is positioned in the field in which error was detected and the field is highlighted in reverse video.

With the second screen (display upon depressing PF10), the user fills-in all the data for a particular item of the Purchase Request.

```
        ---- General Expenses Purchase Request (Item) -----

Subject : Transport by Bus

Maximum amount (FF)      : 10000
Project to be charged    : 4577310
Item number              : 1         PF3 Repeat item    PF4 Add an item

Price request reference : .....     Deliv. delay      :          weeks
Purchaser code          : 99        Purchaser name    : Billiard, Jean
Part number             : ........  EC level          : .........
Quantity                : 1         Measurement unit  : ......
Delivery week (WWYY)    : 22 / 88
Unit price    (FF)      : 1000    (optional)
Item project            : ......  (if different from header)

Cmd= D (Delete), A (Add), R (Repeat)         PF8  Next    PF7  Previous

Item description        : Transport by bus 40 places
                          Vence-La Gaude du xx/xx/xx
--------------------------------------------------------------------------



  PF1 Search PF2 Header PF5 Submit PF11 Prev PF10 Next PF9 Help PF12 File
```

Some data are mandatory : e.g. : Purchaser code; Delivery week; Quantity; At least one line of description or a part number.

Some date are optional : e.g. : Price request reference; Part number; Item unit price; Measurement unit; EC (Engineering Change) level; Item project has to be filled only if it differs from header; and Complementary description lines.

Search procedures are available from this screen by putting the cursor in the selected field and pressing PF1; for price request reference; Purchaser code; part number; delivery week; or project.

The user can type several lines of complementary description for the item. A command area allows adding repeating or deleting lines. Scrolling is possible through PF7 and PF8.

Other PF keys are used :

- PF2 Go to the header screen

- PF3 Repeat the displayed item to create a new one
- PF4 Add a blank item
- PF5 All operations before sending in approval (see below)
- PF10 Display next item if it exists
- PF11 Display previous item if it exists

If the user presses PF12, the system shows the screen below.

```
    ------------- Process The Document ---------------

  Document : General Expenses Purchase Request
Reference:
Subject  : Transport by bus

Press one of the following PF keys.

PF1   View the Document
PF2   Change the Document

PF4   Add comments
PF5   Review Approver List and Submit the Document for Approval
PF6   File the Draft in your Personal Storage for further changes

PF8   Print the Document

To erase the Draft, type DELETE below and Press ENTER

                    ===> ......

PF9   Help
```

From here, the user will be able to :

- PF1 : View the document as it can be viewed later by all the approvers
- PF2 : Change the document data
- PF4 : Add free comments which will be viewed to all the approvers
- PF5 : Prepare sending in approval (see below)

- PF6 : Save the data entered as a draft document (and retrieve it later)

- PF8 : Print the document. A print image of the document is then added in a file called "print file". The user will be able to print this file at the end of the session

- type "DELETE" in the provided field to erase the in process draft

Some of the above defined PF keys functions are self explanatory. Others need some explanations. For instance, by depressing the key PF4, the user gets the following items on his screen :

```
 -------------- Add Personal Comments -------------

Type      : General Expenses Purchase Request
Reference : Draft
Subject   : Transport by Bus

Comments  :
* * * Top of File * * *


PF2 Add line PF3 Return PF8 Erase line PF10 Forward PF11 Backward PF12 File
===>
                                                        Input-mode
1 File
```

The user can type free comments and use PF keys as described hereafter :

- PF2 to add a blank line below cursor position

- PF3 to leave without saving last modifications

- PF8 to delete the line where the cursor is

- PF10 and PF11 to scroll forward and backward through the comments file

- PF12 to save and leave comments entry

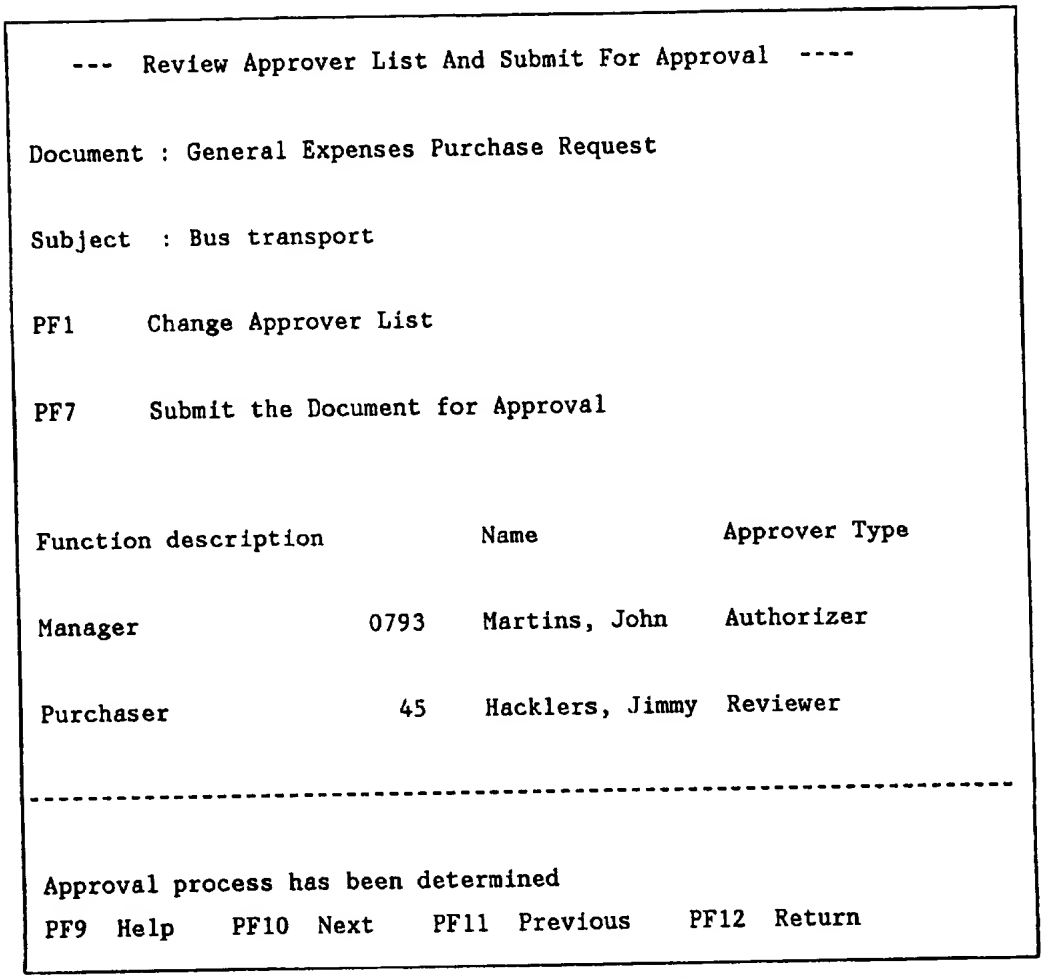
The above operations are summarized in the self explanatory flow-chart of Figure 10.

Down to this point the process lead to a fully prepared document ready for being submitted to the approval process. Therefore, if the user presses PF5 either from the data entry panels, or from the "Process prepared document", the system performs the following operations.

First, it checks all the document data (complete checking). If an error is found, the system displays again the data entry panel where the field bearing an erroneous data is indicated by the cursor. Then, it determines the approval path based on functions involved, specific rules assigned for the type of document involved, and document data (see Figure 14).

If an error is found, the message "Unable to determine approval process" is displayed and no action is performed.

Finally, it determines for each function of the approval process, the acting person at the present time and the titular. The result is displayed (see Figure 15) to the considered user (originator) as shown hereunder for review.



If the user presses PF12, he just returns to "Process the document" Menu.

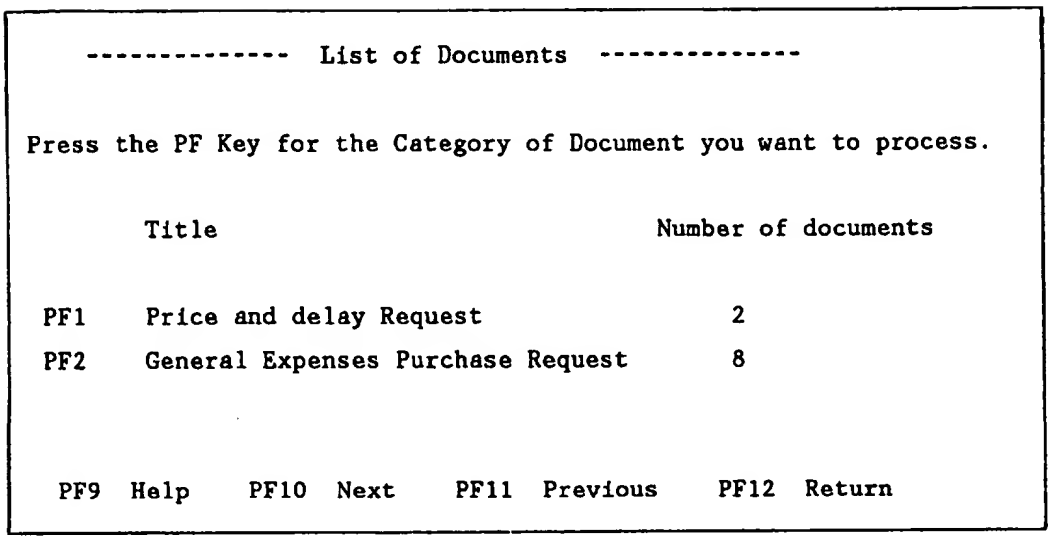
Otherwise, by depressing PF1 he will be able to change the approver list with some controls and restrictions (see below with reference to Figures 15 and 16).

If he does press PF7, the document is created and waits for action of the first function(s) in the approval process (see Figures 15 and 16).

Represented in Figure 11 is a flow-chart summarizing the operations achievable on an already filled-in document. The user can act on documents awaiting his action by pressing PF2 in SEALING Main Menu or directly typing SEALING ACT_ON as a command.

When SEALING has been linked with IBM PROFS application, the user gets a message when depressing the functional key labeled "Open the Mail", assuming SEALING documents are waiting action. The message looks like:

"You have 5 documents awaiting your action in Electronic Approval System. Do you wish to process these ? Type Y and press ENTER if you wish". The system then shows first a list of categories of documents as shown below.



As represented in the flow chart of Figure 11 the user has to select a category by pressing the appropriate PF key. W When the user has selected a category, the system displays the list of documents in the selected category. If there is only one category of documents, the first screen is by-passed.

```
-----  List of Documents awaiting your action  ------

     Form title : General Expenses Purchase Request

 Press the PF Key for the document you want to process.

      ---From---          Date       Reference     Required Action

PF1  Dupont, Philippe     880322     JA022           Review
             Transport by Bus

PF2  Beraud, Serge        880314     JA021           Review
             Safety Glasses

PF3  Dupont, Philippe     880210     JA015           Review
             Tables for the Restaurant

PF4  Dupont, Philippe     880210     JA012           Inform
             Printing Cards

  PF9  Help    PF10  Next    PF11  Previous    PF12  Return
```

The documents list is sorted by date of required action, the more recent are at the top of the list. Eventually scrolling additional screens may be needed. The user can scroll up and down using PF10 and PF11 respectively.

Then selecting one document is achieved by pressing the corresponding PF Key (PF1 to PF8) which displays the following screen.

```
------ Process a Document awaiting your Action ------

Document   : General Expenses Purchase Request   Number JA022
Originator : Dupont, Philippe      0793
Subject    : Transport by Bus

Your Function is : Manager         0793

Press one of the following PF Keys.

PF1      View The Document

PF4      Add Comments
PF5      Add or Modify Data

PF7      Act on the Document
PF8      Print the Document

Previous Approver was : Schmidt, Jimmy

 Personnal Comment from previous Approver :
 OK for me.


PF9  Help    PF12  Return
```

The user can see on this screen the document type and reference, the subject, the originator's name, who was the l last previous approver and personal comments from this previous approver. Also mentioned is the function the present user is asked to act for, and eventually the owner for the function if the user is a delegate.

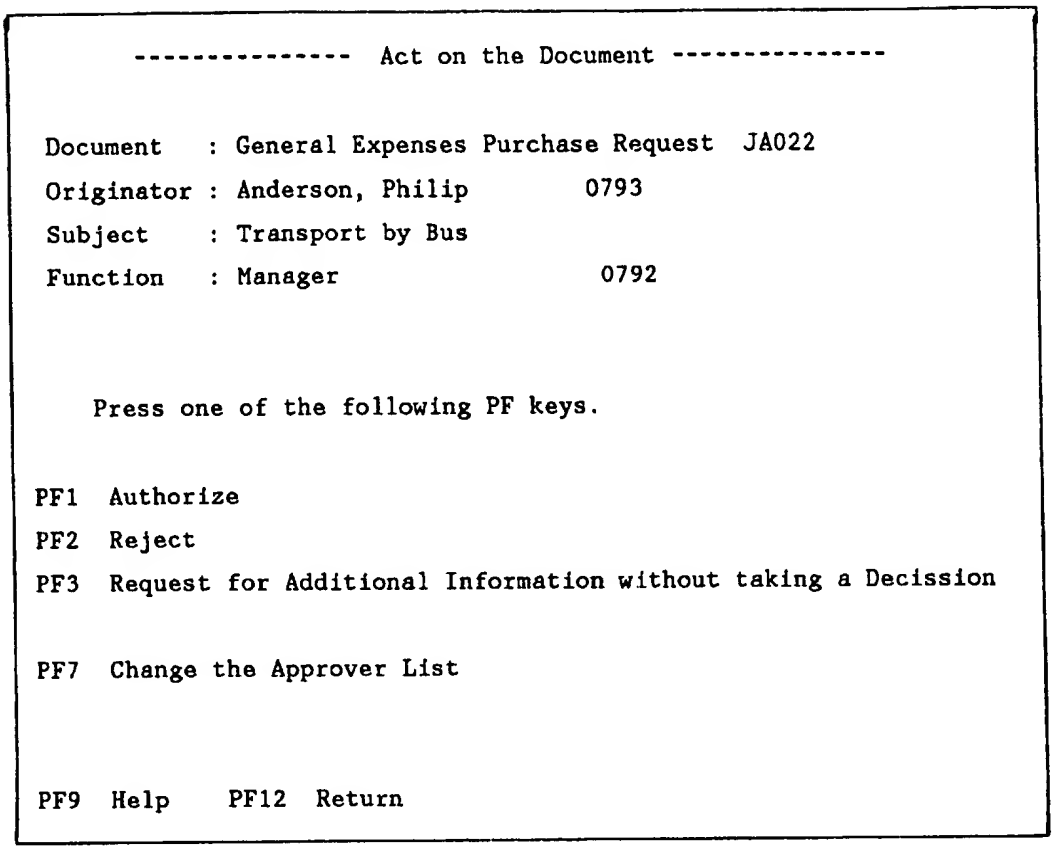
By depressing PF1, the user can view all information about the document, i.e. the document itself; the approver list with decisions of approvers who have already acted on the document; the document originator and approvers comments, if any.

Depressing PF4, enables the user adding his own comments to the other approver's comments after acting on the document.

PF5 is not available for all approvers. This PF Key is only active if the document is originally tailored to authorize the function to add or modify data. In this case, the user is shown data modification panels and can add or modify data in the document. These modifications can affect the approval path process.

PF7 must be used to act on the document.

If the user is an Authorizer, he will see the screen below.



The user can change the approvers list by pressing PF7 (seen later).

The user can Authorize (Approve) the document with PF1. The system will display a confirmation panel which looks as follows.

```
    -------------  Confirm your Authorization  -------------


    Document    : General Expenses Purchase Request  JA022
    Originator  : Anderson, Philip           0793
    Subject     : Transport by Bus
    Function    : Manager                    0792

Press ENTER to confirm your approbation.

Warning : After confirmation you will not be able to change your
          decision.

You can enter a Personal Comment:

-----------------------------------------------------------------

For the next approver(s):
-----------------------------------------------------------------

 Manager          0792          Schmidt, John
                    Delegate of Anderson, David

-----------------------------------------------------------------

PF9  Help    PF12  Return
```

The next screen shows the next approver and allows the user to type one line of personal comments for said next approver's attention.

If the user is the last approver, the confirmation panel is different and looks as follows :

```
------------  Confirm your authorization  ------------

Document    : General Expenses Purchase Request  JA022
Originator  : Anderson, Philip          0793
Subject     : Transport by Bus
Function    : Manager                   0792

You are the last approver. This document will be finalized.

Press ENTER to confirm your approbation.

PF9  Help    PF12  Return
```

Authorization means finalization of the document.
An Authorizer can also Reject the document. The system will display a confirmation panel which looks as follows.

```
          ------------- Confirm your reject --------------

Document   : General Expenses Purchase Request  JA022
Originator : Anderson, Philip          0793
Subject    : Transport by Bus
Function   : Manager                   0792

Press ENTER to Confirm your Reject.

Warning : After confirmation you will not be able to change your
          decision.


You can type below a Personal COmment for approvers and originator
MYREMK

Information will be sent to approvers who have already viewed
this document
------------------------------------------------------------------
Manager              0793       Martins, John

------------------------------------------------------------------

PF9  Help    PF12  Return
```

The system asks the user to confirm his decision, indicating that in case of non confirmation, the document will be rejected, an information will be sent to the originator and to each approver who has already acted on the document.

The user may also choose PF3 to request additional information from another approver.

In this case, the user has to choose an approver in the screen below.

```
------ Request for Additional Information ------

Document   : General Expenses Purchase Request  JA022
Originator : Anderson, Philip          0793
Subject    : Transport by Bus
Function   : Manager                   0792

To request for additional information, choose an approver and
type an X next to your choice below.
When you have made your choice on this screen, press ENTER.

   Function      Description      Name
-------------------------------------------------------------

 - Originator     079954          Jacobson, Steve

 - Manager          0792          Martin, John

 - Purchaser          45          Tucson, Joe


  PF9 Help   PF10 Next   PF11 Previous   PF12  Return
```

He can choose the originator, an approver who has already acted on the document or an approver who has not yet seen the document, then he gets a confirmation panel as below.

```
----- Confirm your request for additional information -----

Document    : General Expenses Purchase Request JA022
Originator  : Anderson, Philip        0793
Subject     : Transport by bus
Function    : Manager                 0792


Press ENTER to Confirm your Choice, and the Document will be sent
to the Manager                  0793      Schmidt, John


PF9  Help    PF12  Return
```

If the user confirms, the document is available for the chosen approver and the user will get it back again after this approver has acted upon said document. If the user is a Reviewer in the approval process, he is shown the following screen.

```
--------------- Act on the Document ---------------


Document    : General Expenses Purchase Request JA022
Originator  : Anderson, Philip        0793
Subject     : Transport by bus
Function    : Manager                 0792

     Press one of the following PF keys.

PF1  Approve
PF2  Disapprove
PF3  Request for Additional Information without taking a Decision

PF7  Change the Approver List


PF9  Help    PF12  Return
```

There will be two different confirmation panels no matter whether the user is the last approver or not. Request for

additional information operation is quite the same as requested to an Authorizer. It should be remembered that a Reviewer cannot reject a document. He can just disapprove the document, in which case a further Authorizer approval is required. The system determines if there is an authorizer in the list of next approvers. If there is no Authorizer in the list of next approvers, the system asks the user to choose among the Authorizers who have already acted on the document and will send the document back to the chosen Authorizer who will have to confirm his previous authorization or to reject the document.

If the document has been received for information only, the user is shown the following screen.

```
------- Document received for Information only -------

Document   : Genera Expense Purchase Request     Number : JA022
Originator : Anderson, Philip          0793
Subject    : Transport by Bus

Your Function is : Manager             0792

 Press one of the following PF Keys.

 PF1  View the Document

 PF4  Erase the Document from your incoming mail and keep in your
      mail log

 PF5  Modify and Send again for approval

 PF8  Print the Document

Previous Approver was : Durand, Andre


            Personnal Comment from previous Approver :

   PF9  Help    PF12  Return
```

The user can receive such information in several instances. He may be the originator and the document has been a a a accepted. Action is therefore currently in process for execution. Or the document has been rejected by an Authorizer or has been cancelled by the originator and the user is either the Originator or an Approver who has already acted on it.

PF4 has just the effect to cancel reference reminder to said documents. The user can always access the document using consultation facilities.

PF5 is available on this screen only if the document was rejected. It enables the originator retrieving all the document data, correct something, and send again very quickly (with a new reference) if he wants.

Obviously, any user should be able to consult documents he has originated or acted upon, by pressing PF3 in the

Main Menu or directly typing SEALING CONSULT as a command.
The menu below is then shown to the user.

```
-----  Consult Documents you have originated or acted upon -----

Press one of the following PF Keys.

PF1  List Documents in approval process you have originated
PF2  List Documents in approval process you have acted upon
PF3  List Documents you have originated between 880301 and 880314
PF4  List Documents you have acted upon between 880301 and 880314
PF5  List Documents with search information specific to a form


   PF9  Help    PF12  Return
```

The user can access documents using several alternatives (see Figure 12):

- PF1 : Lets the user access the documents he has originated and which are currently in the approval process. NB: by user one means the person assigned corresponding function.
- PF2 : Lets the user access the documents he has processed and which are currently in the approval process.
- PF3 : Lets the user access all the documents, whatever their status (in progress, finalized, rejected, cancelled...) he has originated between two dates the user can modify.
- PF4 : Lets the user access all the documents (whatever be their status), he has acted upon between two dates the user can modify.
- PF5 : Lets the user access documents issued with criteria specific to a form.

Whatever the PF key chosen, the result will be either the message "no document found", or a list of documents found as shown hereafter:

If the user chooses PF1 to PF4, a list of found form categories is displayed whenever more than one category has been used, otherwise the "List of Documents Found" is displayed.

```
--------------- List of Documents found ---------------

Type : General Expenses Purchase Request

Press the PF Key for the Document you want to consult.

     Subject                                Number        Status
PF1  Transport by Bus                       JA022         In Progress
          You have acted as: IBM employee       079954 on 880314
PF2  Flowers buy                            JA021         In Progress
          You have acted as: IBM employee       079954 on 880312
PF3  Car maintenance                        JA020         Finalized
          You have acted as: Manager            0793   on 880312
PF4  Protection glasses                     JA019         Rejected
          You have acted as: IBM employee       079954 on 880312
PF5  Repaint                                JA018         Finalized
          You have acted as: Controller         LGE    on 880312
PF6  Garden maintenance                     JA014         Executing
          You have acted as: IBM employee       079954 on 880305
PF7  Request for Writing Assistant          JA012         Rejected
          You have acted as: IBM employee       079954 on 880304
PF8  Electronic components                  JA011         Executed
          You have acted as: IBM employee       079954 on 880304


 PF9  Help    PF10  Next    PF11  Previous    PF12  Return
```

If there are more than 8 documents found, the user can scroll through the list using PF10 and PF11. For each d d document found, the information displayed include : subject, status, function for which the user can access the document, date of action.

If the user chooses PF5, he will first have to make a choice among categories prior to accessing forms within a category. a criteria entry panel is displayed requesting additional precisions on the query. Suppose the user has chosen General Expenses Purchase Request, the following Screen is then presented :

```
---------- Enter search criteria ----------

Type : General Expenses Purchase Request

Reference : .....

Dates between : 880301  and  880314

Amount between : ..........  and  ..........

Project to be charged : .......

Subject contains : ........................................


PF9  Help    PF12  Return
```

The user has to enter the criteria for searching. If he leaves a blank, the system interprets as the largest query, e. g. if amount is not filled-in, the system searches from 0 to 9. The system begins searching when the user presses enter key.

When the user has selected a document, the screen displayed depends on the document status.

If the status is "In progress", the user is presented with the screen below.

```
-------------- Process the Document Found ---------------

Document   : General Expenses Purchase Request  JA022  In progress
Originator : Anderson, Philip        0793
Subject    : Transport by bus

Press one of the following PF Keys.

PF1  View the Document

PF5  Copy the Document and create a Draft
PF6  Cancel the Document
PF7  Change Approver List
PF8  Print the Document


PF9  Help    PF12  Return
```

The user can
- view the document (data, approvers list and comments).
- copy the document to create a draft
- print the document

If he is the originator, he can also cancel the document. In this case, the user is presented the following confirmation panel.

```
-------------- Confirm your canceling --------------


Document   : General Expenses Purchase Request  JA022  In progress
Originator : Anderson, Philip        0793
Subject    : Transport by bus

Confirmation will be requested and other approvers advised


PF9  Help    PF12  Return
```

Pressing PF7 in "Process the document found" menu allows the originator or an approver who has already acted

on the document to change the approver list as he could have done when originating the document or acting upon the document.

When changes are prepared, the system displays the following panels.

```
-------------- Resend after changing approver list --------------

Document   : General Expenses Purchase Request  JA022  In progress
Originator : Anderson, Philip          0793
Subject    : Transport by bus

PF1  Resend

PF7  Change approver list

     PF9  Help    PF12  Return
```

If all changes are correct, the user can press PF1 and the document proceeds with the new approver list. PF12 will cancel all the changes.

If the status of the document is not "In progress", the available actions are different as shown hereafter.

```
  -------------- Process the Document Found --------------


  Document   : General Expenses Purchase Request  JA022  Executing
  Originator : Anderson, Philip        0793
  Subject    : Car transportation


 Press one of the following PF Keys.

      PF1  View the Document

 PF4  View the Document Follow-Up
PF5  Copy the Document and create a Draft

PF8  Print the Document


 PF9  Help    PF12  Return
```

The user can
- view the document (data, approver list and comments).
- copy the document to create a draft
- print the document

Follow-up information may also be given when the user presses PF4. These information indicate what action are being taken by the person who has to process the document. For example, for a purchase request, the system will keep track and report for orders sent to the suppliers, indicate the supplier delivery date, the quantity already received, etc...

All above disclosed consulting operations are summarized in the self explanatory flow chart of Figure 12.

Any user can access the list of documents awaiting someone else's action by pressing PF5 on SEALING Main Menu. The following is then displayed.

```
------ Look awaiting someone else's document ------

Enter or modify the userid and node (if different from this node)

Press Enter to validate.

Userid : DUPONT__   Node : LGEVM2__   Name : Dupont, Philippe

Type of Document                          Reference of document

General Expenses Purchase Request         JA079
General Expenses Purchase Request         JA092
Travel Request                            T56435
General Expenses Purchase Request         JB435

 ENTER        PF10  Next        PF11  Previous        PF12  Return
```

The user has to fill in the userid field and press enter. If userid is not known, an error message is displayed. If the userid is known, the system looks for documents awaiting action and give the references. For obvious security purposes, no further information about document can be obtained.

As already mentioned an approver designation, could be delegated from one user to another under predefined conditions. The user can access this part of the system by pressing PF7 on the SEALING Main Menu or directly typing SEALING DELEGATE as a command.

He is shown the screen below.

```
------ Delegate or Retrieve Approval Authority ------

For entering or modifying the userid and node (if different
from this node) of the person you wish to delegate your authority to.

Enter your own userid and node to retrieve your function.

Press Enter to validate.

Function Manager                          0792

Userid : VOIRON__  node : LGEVM2__   name : Voiron, Jean

  Function IBM Employee                   025654

Userid : MARIN__  node : LGEVM2__   name : Marin, Pierre


PF1 Search PF5 Previsions PF9 Help PF10 Next PF11 Previous PF12 Return
```

The screen contains the list or functions said user is titular for, presently. The userid which is indicated for each function is the userid of the person who is actually acting for this function. One can change this userid, either to indicate a delegation or to put his own userid and retrieve his authority.

For certain functions, delegation may not be allowed. The user cannot use this screen to delegate. He has to ask the function responsible (e.g. Financial Department) to register the delegation. However, the user can retrieve his authority for any function.

It is also possible to blank the userid field. In this case, the system considers the user as absent. This feature will be used to bar access to the document for instance when an approver is acting on it. So, originators and approvers will be informed and will be able to react to this situation.

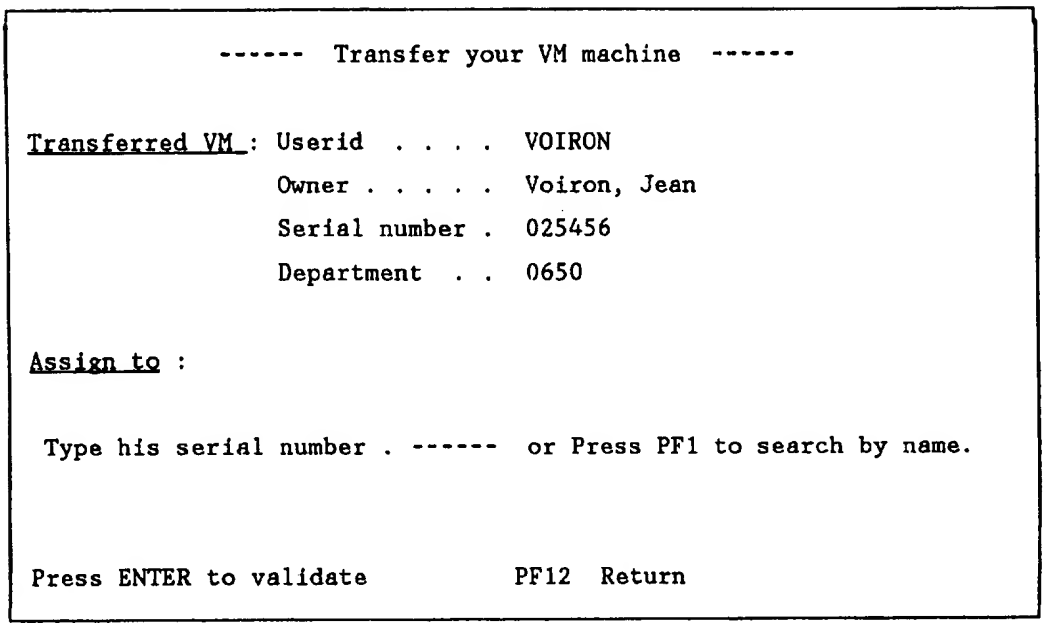
To validate his entries, the user has to press the enter key.

Using PF1 allows the user to search for the userid of someone whom he knows only by his name or nickname. The user can press PF5 to enter delegation previsions. He is shown the screen in which he can type prevision dates for his delegations.

In this case, the delegation is not activated immediately, but will be automatically set by the system at the selected date. The above described delegation process is summarized in the flow chart of Figure 13.

In a large company environment, temporary general machine delegation may be required for replacing someone absent for vacation or for any other reasons. Under these circumstances stored data and any information belonging to one user need be transferred to another user (assignee). This is achieved, in VM environment, by transferring a VM machine from one individual to another. Under these circumstances however the signature delegation should barred unless formally requested.

The user can access this application by pressing PF8 in the SEALING Main Menu or directly typing SEALING EASPRET as a command. The following screen is then presented.

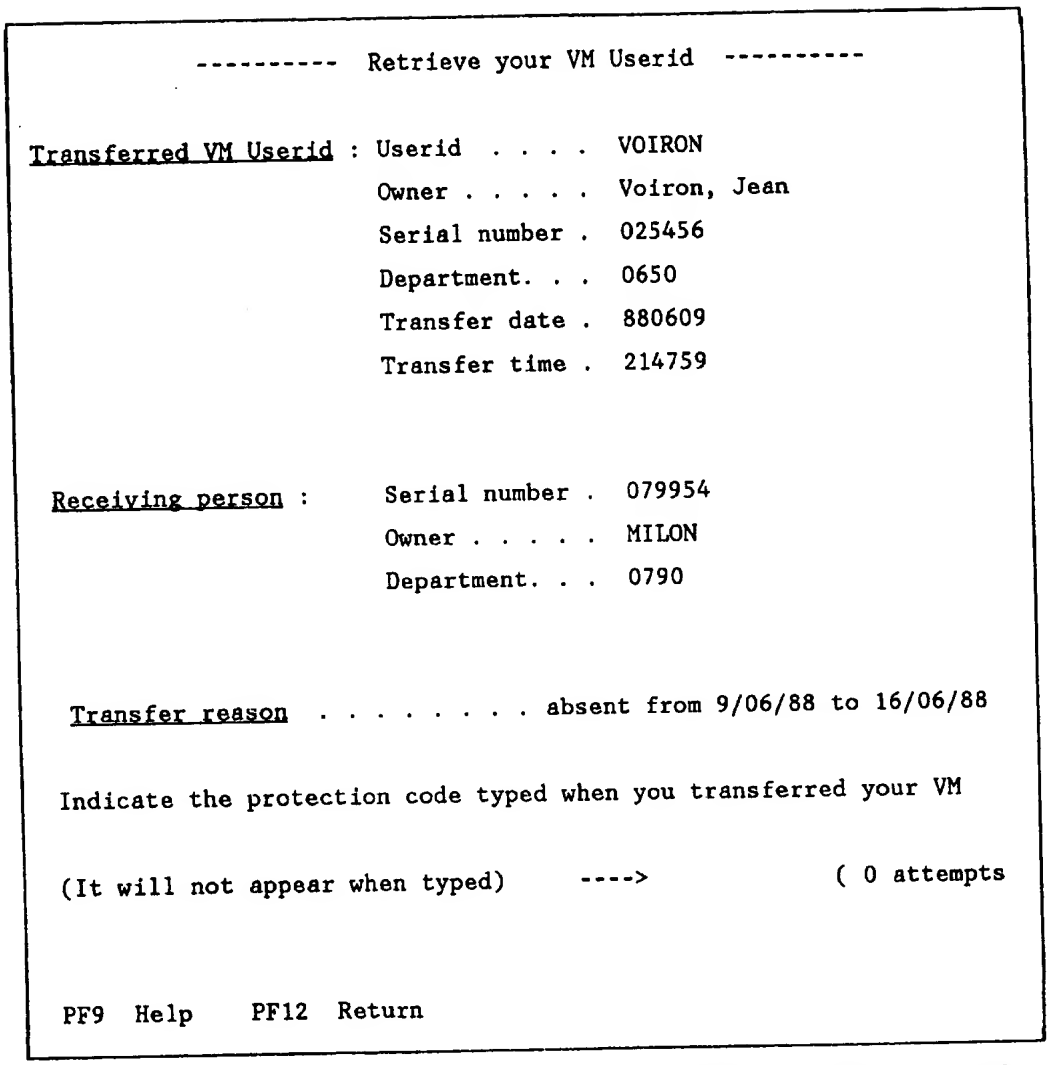


The user has to fill-in the serial number of the receiving person (assignee). If needed, PF1 may provide help. When a right identification of the receiving person has been given, the screen below is displayed.

```
------ Transfer your VM Userid and Password ------


Transferred VM Userid : Userid . . . .  VOIRON
                        Owner . . . . .  Voiron, Jean
                        Serial number .  025456
                        Department. . .  0650

Receiving person :      Serial number .  079954
                        Owner . . . . .  MILON
                        Department. . .  0790


Reason for transfer . . . . . absent du 9/06/88 au 16/06/88

Indicate a protection code which will be asked when retrieving your
VM machine (It will not appear when typed)

Type it twice for control :      --->
                                 --->


PF9  Help    PF12 - Return
```

The user can see the complete identification of the chosen person. He can type an optional comment and he has to type twice a protection code which does not appear when typed. This code will be required for canceling the machine transfer.

The screen below is shown to the user when he pressed PF8 on SEALING Main Menu or typed SEALING EA-SPRET on the command line and when the VM has previously been declared as transferred.



To cancel his transfer, the user has to type the protection code he selected when registering the transfer.

Having thus described from a technical as well as functional standpoint, the means involved in this invention, one may therefore fully comprehend the approval system operation. Approval system operations has however been summarized in Figures 14 through 17, and Function management in Figure 18.

Represented in Figures 14 through 16 are, the means involved in the determination of the list of approvers. Obviously, the system has been limited to simple cases to simplify explaining the operation. One assumes the filled-in document (e.g. Purchase Order) includes a Project code, a Purchaser code and an Amount of expenses set by the purchase requesting user. The software means uses the project code reference to address a first specific function table (FàMANAD1) and fetch the reference of the company department in charge of said project therefrom. Should, in addition, the purchase value exceed a threshold (10000), a second table (FàMANAD2) needs be addressed. Also, due to the type of document involving expenses, the logic adds an Investment Responsible (INVT) to the list of required approvers. Same applies to Purchaser (PURC). The system loads the information into two separate tables located in the document originator VM user's machine memory designated as FUTU and DONE respectively. The DONE table contains so called "shadow" approvers or virtual approvers whom the system will enable read-only access to the corresponding document. As already mentioned, once initiating the approval process, the originator may amend the list of approvers up to a certain extent based on predefined rules. For instance, deletion of a first line manager from the list of approvers will trigger automatic insertion of the second line manager, and so on.

Then, the originator sending decision has the effect to unload the first approver references from FUTU table into a NEXTWAIT table while the others are loaded into a NEXTFUTU table in the preset ordered list, both tables NEXT

being in the user's VM machine. The shadows are loaded into NEXDONE table. The above mentioned tables will be used by the system for building and updating the corresponding SQL data base tables, i.e. APPFUTU, APPWAIT and APPDONE of the SEALBDA machine.

The SEALING system also controls mailing approval requests to designated approvers whose action are controlled as represented in Figure 16.

The designated approver in NEXTWAIT gets access to the data in the corresponding SQL/DS tables in its own VM machines into FUTU, WAIT and DONE tables. Then NEXTFUTU, NEXTWAIT and NEXT DONE are set from FUTU, WAIT and DONE tables respectively. These tables contents are used by current approver to perform and record the following operations:

- Approver list modification: the approver may amend the list as the originator was able to do.

- Modification to approval process: the system controlled by any amendment to the data of document due to current approver, amends the approval path accordingly, and

- Approver validation: compliance test with the approver's designation rules is performed.

Tables updating are performed, i.e. once current approval is executed, a shift is operated with next approver in NEXTFUTU being shifted into NEXTWAIT.

Once forwarded, the current approval data are used to update the SQL/DS tables through add, modify or delete operations. They are then available for next approver's action and so on.

A fairly high security level has been provided in this invention to limit false approvals due either to human error or to voluntary operation. First, one should notice that approval, i.e. insertion of a "Y" or "N" flag into a predetermined field characterizing the considered document is inserted into the SQL/DS Table APPDONE otherwise accessible to the user on a Read-Only basis (see MYSIGNAT in Figure 6). Second, said "signature" or approval insertion is operated only upon execution of a predetermined SQL command involving a signature validity check. The flow chart of such a signature validation operation is illustrated in Figure 17. The SQL command triggered by the MYSIGNAT order accesses various SQL tables to gather data stored therein to ensure that the user presently trying to approve or disapprove is entitled to do so. First APPWAIT table is accessed to ensure that the considered document defined by typdoc/refdoc is waiting therein. Function defined by Typfun/Reffun shoudl also match with user's function, cross-checked with function references and acting habilitation as provided by FUNCTION Table. also, since VM machines might be transferred from one user to another (and recorded in INPRET Table accordingly), coinciding userid/nodeid with present user are checked. Then insertion into APPDONE Table, together with data and time are enabled upon a positive signature validation test result.

As mentioned, the population of users attached to the same approval system is managed in an unique SQL table, i.e. the FUNCTION Table, as represented in Figure 18. For each function, i.e. Manager, Purchaser, etc... a SQL view is defined to limit any user's access to the corresponding function, assuming he had been "granted" (SQL terminology) access. The system is made to grant access to a function "owner" responsible for creating and managing titular designation within each function. Some functions and titulars may already be known to other systems (e.g. within a conventional personnel department data base). In that case, Function table updating are directly performed by a program linking both involved data bases. A similar approach is also used for setting and maintaining the so called specific characteristic table.

Claims

1. A system for controlling the processing and routing of a user originated document requiring electronic approval by selected system users, in an electronic mailing system including terminals (T1, T2, T3) attached to a digital network, user's Virtual Machines (VM) including computer means, memory and software facilities assigned to individual users, each user being assigned at least one job or function within the population of system attached users, and software controlled computer means for generating, processing and monitoring electronic documents to be mailed from any terminal to any user for approval, said approval system including means for scheduling approval tasks for users and means for defining a path or route specification for any document to be approved by various users, said means for scheduling approval and specifying a path being characterized in that it includes :

   first storage means (SEALDBA Machine; Function Tables) and terminal controllable means for storing and updating prestored function tables wherein each system user's function and address are identified ;

second storage means (SEALDBA Machine; Document tables) for storing document forms into data base tables, in Structured Query Language (SQL) form, and software operated computer means for linking said tables together in a tree-shaped arrangement ;

third storage means (SEALDBA Machine Approval Tables) for storing predefined approval rules based on user's function and document forms contents ;

terminal controllable means (User's Virtual Machine) for selecting, accessing, filling-in, processing and mailing any selected form whose contents is to be subjected to approval;

first software controlled computer means sensitive to said mailing for addressing said function tables and, based upon said approval rules, for dynamically determining the approval path or route among the system attached users, said means for determining the approval route including :

second software controlled computer means sensitive to said approval rules for reading document data by addressing specific SQL data tables;

third software controlled computer means (FQMANAD1, FàMANAD2) sensitive to said read data to address said function tables and fetch approvers' references therefrom ;

fourth software controlled computer means sensitive to said stored approval rules for listing said approvers' references in a predefined sequential order into an approval list ; and,

fourth storage means for storing said approval list into a table (FUTU) whereby said approval path is determined and used for monitoring the mailing and processing of said filled-in form accordingly.

2. A system according to claim 1 further including fifth software controlled computer means sensitive to read data for generating an additional list of users assigned access to corresponding document data on a read-only basis ; and storage means for storing said additional list into a table (DONE).

3. A system according to claim 2 further including :

display means for displaying said FUTU table to the document originating user ;

sixth software controlled computer means sensitive to said stored rules for enabling said originating user to check and amend said FUTU table ; and,

seventh software controlled computer means for initiating the document approval process upon completion of said checking.

4. A system according to claim 3 wherein said means for initiating the document approval process include :

eighth software controlled computer means for loading first approver in the FUTU table into a prestored NEXTWAIT table and loading remaining FUTU table contents into a prestored NEXTFUTU table ; and,

ninth software controlled computer means sensitive to NEXTWAIT table contents to mail a predefined message to the corresponding approver's VM-machine.

5. A system according to claim 4 including :

tenth software controlled computer means for unloading said DONE table into a prestored NEXTDONE table within VM user's machine ; and

eleventh software controlled computer means for unloading NEXTFUTU, NEXTWAIT and NEXTDONE user's tables into prestored SQL tables APPFUTU, APPWAIT and APPDONE respectively.

6. A system according to claim 5 wherein said means for managing appropriate approvals include :

user's terminal controllable means for requesting access to system SQL tables ;

system controllable means for accessing stored function tables, comparing terminal user's identification to approver's as stored into said function tables and, upon positive check, unloading contents of predefined fields of APPFUTU, APPWAIT and APPDONE SQL tables into user's VM machine tables FUTU, WAIT and DONE respectively ;

system controllable means sensitive to said user's machine tables contents for displaying preselected data from documents waiting for said user's approval ;

user's terminal controllable means for selecting one of said documents whereby said selected document is being displayed to said user ; and

terminal controllable means for said user inserting approval or disapproval decision (signature) into a predefined document field.

7. A system according to claim 6 wherein said means for inserting user's decision include system controlled decision (approval) validation means and, upon correlative positive validity check, means sensitive to said validation means for writing user's decision into SQL table APPDONE otherwise accessible on a read-only basis.

8. A system according to claim 7 wherein said approval validation means include software controlled computer means for fetching a system prestored SQL command and means sensitive to said command for triggering said approval validity check.

9. A system according to claim 8 wherein said approval validation means include :

software controlled computer means for addressing the APPWAIT system table and checking presence of the considered document therein; and,

software controlled computer means for addressing APPWAITing document data and function table to check concurrence with operating user's identification.

Patentansprüche

1. System zum Steuern der Verarbeitung und des Weiterleitens eines vom Nutzer erzeugten Dokumentes, das eine elektronische Genehmigung durch ausgewählte Systemnutzer erfordert, in einem elektronischen Postsystem mit Datenstationen (T1, T2, T3), die an ein digitales Netz angeschlossen sind, Virtuellen Maschinen (VM) des Nutzers mit Computermitteln, Speicher und Softwareeinrichtungen, die individuellen Nutzern zugeordnet sind, wobei jedem Nutzer mindestens ein Job oder eine Funktion innerhalb der Gesamtheit der an das System angeschlossenen Nutzer zugeordnet ist, und durch Software gesteuerten Computermitteln zum Erzeugen, Verarbeiten und Überwachen elektronischer Dokumente, die von irgendeiner Datenstation an irgendeinen Nutzer zur Genehmigung zu senden sind, wobei das Genehmigungssystem Mittel zum Planen der Genehmigungsvorgänge für Nutzer und Mittel zum Definieren eines Pfades oder einer Leitwegspezifikation für irgendein durch verschiedene Nutzer zu genehmigendes Dokument umfaßt, wobei das Mittel zum Planen der Genehmigung und zum Angeben eines Pfades dadurch gekennzeichnet ist, daß es folgendes umfaßt:

erste Speichermittel (SEALDBA-Maschine; Funktionstabellen) und durch die Datenstation steuerbare Mittel zum Speichern und Aktualisieren vorher gespeicherter Funktionstabellen, in denen die Funktion und die Adresse jedes Systemnutzers gekennzeichnet sind;

zweite Speichermittel (SEALDBA-Maschine; Dokumenttabellen) zum Speichern von Dokumentformularen in Datenbanktabellen im Formular der Structured Query Language (SQL) und durch Software betriebene Computermittel zum Verbinden der Tabellen miteinander in einer baumförmigen Anordnung;

dritte Speichermittel (SEALDEA-Maschine; Genehmigungstabellen) zum Speichern vordefinierter Genehmigungsregeln basierend auf der Funktion des Nutzers und dem Inhalt der Dokumentformulare;

durch die Datenstation steuerbare Mittel (Virtuelle Maschine des Nutzers) zum Auswählen, Zugreifen, Ausfüllen, Verarbeiten und Senden irgendeines ausgewählten Formulars, dessen Inhalt genehmigungspflichtig ist;

erste durch Software gesteuerte Computermittel, die auf das Senden ansprechen, um die Funktionstabellen zu adressieren und um, basierend auf den Genehmigungsregeln, den Genehmigungspfad oder Leitweg zwischen den an das System angeschlossenen Nutzern dynamisch zu bestimmen, wobei das Mittel zum Bestimmen des Genehmigungsleitweges folgendes umfaßt:

zweite durch Software gesteuerte Computermittel, die auf die Genehmigungsregeln ansprechen, um Dokumentdaten durch das Adressieren spezieller SQL-Datentabellen zu lesen;

dritte durch Software gesteuerte Computermittel (FQMANAD1, FàMANAD2), die auf das Lesen der Daten ansprechen, um die Funktionstabellen zu adressieren und Verweise der Genehmiger daraus abzurufen;

vierte durch Software gesteuerte Computermittel, die auf die gespeicherten Genehmigungsregeln ansprechen, um die Verweise der Genehmiger in einer vordefinierten sequentiellen Reihenfolge in eine Genenmigungsliste aufzufisten; und

vierte Speichermittel zum Speichern der Genehmigungsliste in eine Tabelle (FUTU), wodurch der Genehmigungspfad bestimmt und verwendet wird, um das Senden und Verarbeiten des ausgefüllten Formulars entsprechend zu überwachen.

2. System gemäß Anspruch 1, das weiterhin fünfte durch Software gesteuerte Computermittel umfaßt, die auf das Lesen von Daten ansprechen, um eine zusätzliche Liste von Nutzern zu erzeugen, denen der Zugriff auf entsprechende Dokumentdaten auf einer Nurlesebasis zugeordnet ist; und Speichermittel zum Speichern der zusätzlichen Liste in eine Tabelle (DONE).

3. System gemäß Anspruch 2, das weiterhin folgendes umfaßt:

Anzeigemittel zum Anzeigen der FUTU-Tabelle an den das Dokument erzeugenden Nutzer;

sechste durch Software gesteuerte Computermittel, die auf die gespeicherten Regeln zum Aktivieren des erzeugenden Nutzers ansprechen, um die FUTU-Tabelle zu überprüfen und zu ergänzen; und

siebente durch Software gesteuerte Computermittel zum Einleiten des Dokumentgenehmigungsprozesses nach Abschluß der Überprüfung.

4. System gemäß Anspruch 3, wobei die Mittel zum Einleiten des Dokumentgenehmigungsprozesses folgendes umfassen:

achte durch Software gesteuerte Computermittel zum Laden erster Genehmiger in der FUTU-Tabelle in eine vorher gespeicherte NEXTWAIT-Tabelle und Laden des verbleibenden Inhalts der FUTU-Tabelle in eine vorher gespeicherte NEXTFUTU-Tabelle; und

neunte durch Software gesteuerte Computermittel, die auf den Inhalt der NEXTWAIT-Tabelle ansprechen, um eine vordefinierte Nachricht an die entsprechende VM-Maschine des Genehmigers zu senden.

5. System gemäß Anspruch 4 mit:

zehnten durch Software gesteuerten Computermitteln zum Ent laden der DONE-Tabelle in eine vorher gespeicherte NEXTDONE-Tabelle innerhalb der VM-Maschine des Nutzers; und

elften durch Software gesteuerten Computermitteln zum Entladen der NEXTFUTU-, NEXTWAIT- und NEXTDONE-Tabellen des Nutzers in vorher gespeicherte SQL-Tabellen APPFUTU, APPWAIT bzw. APPDONE.

6. System gemäß Anspruch 5, wobei die Mittel zum Verwalten entsprechender Genehmigungen folgendes umfassen:

durch die Datenstation des Nutzers steuerbare Mittel zum Anfordern des Zugriffs auf System-SQL-Tabellen;

durch das System steuerbare Mittel zum Zugreifen auf gespeicherte Funktionstabellen, zum Vergleichen der Kennzeichnung der Datenstation des Nutzers mit der des Genehmi gers, wie in den Funktionstabellen gespeichert, und, nach positiver Überprüfung, zum Entladen des Inhalts vordefinierter Felder der APPFUTU-, APPWAIT- und APPDONE-SQL-Tabellen in VM-Maschinentabellen FUTU, WAIT bzw. DONE des Nutzers;

durch das System steuerbare Mittel, die auf den Inhalt der Maschinentabellen des Nutzers ansprechen, um vorher ausgewählte Daten von Dokumenten, die auf die Genehmigung des Nutzers warten, anzuzeigen;

durch die Datenstation des Nutzers steuerbare Mittel zum Auswählen eines der Dokumente, wodurch das ausgewählte Dokument dem Nutzer angezeigt wird; und

durch die Datenstation steuerbare Mittel zum Einfügen der Genehmigungs- oder Nichtgenehmigungsentscheidung (Unterschrift) des Nutzers in ein vordefiniertes Dokumentfeld.

7. System gemäß Anspruch 6, wobei die Mittel zum Einfügen der Entscheidung des Nutzers durch das System gesteuerte Mittel zum Prüfen der Gültigkeit der Entscheidung (Genehmigung) umfassen und, nach ergänzender positiver Überprüfung der Gültigkeit, Mittel umfassen, die auf die Mittel zur Gültigkeitsprüfung ansprechen, um die Entscheidung des Nutzers in die SQL-Tabelle APPDONE zu schreiben, auf die sonst auf einer Nurlesebasis zuzugreifen ist.

8. System gemäß Anspruch 7, wobei die Mittel zum Prüfen der Gültigkeit der Genehmigung durch Software gesteuerte Computermittel umfassen, um einen im System vorher gespeicherten SQL-Befehl abzufragen, und Mittel, die auf den Befehl zum Auslösen der Überprüfung der Gültigkeit der Genehmigung ansprechen.

9. System gemäß Anspruch 8, wobei die Mittel zum Prüfen der Gültigkeit der Genehmigung folgendes umfassen:

durch Software gesteuerte Computermittel zum Adressieren der APPWAIT-Systemtabelle und zum Überprüfen des Vorhandenseins des betrachteten Dokumentes darin; und

durch Software gesteuerte Computermittel zum Adressieren von Dokumentdaten in APPWAIT und der Funktionstabelle zum Überprüfen der Übereinstimmung mit der Kennzeichnung des betreibenden Nutzers.

Revendications

1. Système destiné à commander le traitement et l'acheminement d'un document originaire d'un utilisateur nécessitant une approbation électronique par des utilisateurs choisis du système, dans un système de courrier électronique comprenant des terminaux (T1, T2, T3) connectés à un réseau numérique, des machines virtuelles d'utilisateur (VM) comprenant un moyen d'ordinateur, des aménagements de mémoire et de logiciel affectés à des utilisateurs individuels, chaque utilisateur étant affecté à au moins un travail ou une fonction à l'intérieur de la population d'utilisateurs connectée au système, et un moyen d'ordinateur commandé par logiciel destiné à générer, traiter et surveiller des documents électroniques devant être envoyés à partir d'un terminal quelconque vers un utilisateur quelconque pour approbation, ledit système d'approbation comprenant un moyen destiné à planifier les tâches d'approbation pour les utilisateurs et un moyen pour définir une spécification de trajet ou cheminement pour tout document à approuver par les divers utilisateurs, ledit moyen destiné à planifier les approbations et à spécifier un trajet étant caractérisé en ce qu'il comprend :

un premier moyen de mémorisation (machine SEALDBA, tableaux de fonction) et un moyen pouvant être commandé par terminal destiné à mémoriser et à mettre à jour des tableaux de fonction préenregistrés dans lesquels sont identifiées chaque fonction et adresse d'utilisateur du système,

un second moyen de mémorisation (machine SEALDBA, tableaux de document) destiné à mémoriser des formulaires de document dans des tableaux de base de données, sous forme de langage de requêtes structurées (SQL) et un moyen d'ordinateur fonctionnant par logiciel destiné à relier ensemble lesdits tableaux dans un agencement arborescent,

un troisième moyen de mémorisation (machine SEALBDA, tableaux d'approbation) destiné à mémoriser les règles d'approbation prédéfinies basées sur la fonction de l'utilisateur et contenus des formulaires de docu-

ments,

un moyen pouvant être commandé par terminal (machine virtuelle d'utilisateur) destiné à choisir, accéder à, remplir, traiter, et expédier tout formulaire choisi dont le contenu doit être soumis à approbation,

un premier moyen d'ordinateur commandé par logiciel répondant audit courrier afin d'adresser lesdits tableaux de fonction et basé sur lesdites règles d'approbation, afin de déterminer de façon dynamique le trajet ou cheminement d'approbation parmi les utilisateurs reliés au système, ledit moyen destiné à déterminer le cheminement d'approbation comprenant :

un second moyen d'ordinateur contrôlé par logiciel répondant auxdites règles d'approbation pour lire les données de document en adressant des tableaux de données SQL,

un troisième moyen d'ordinateur contrôlé par logiciel (FQMANAD1, FàMANAD2) répondant auxdites données lues pour adresser lesdits tableaux de fonctions et récupérer les références d'approbateurs à partir de ceux-ci,

un quatrième moyen d'ordinateur commandé par logiciel répondant auxdites règles d'approbation mémorisées afin d'établir la liste desdites références d'approbateurs dans un ordre séquentiel prédéfini en une liste d'approbation, et

un quatrième moyen de mémorisation afin de mémoriser ladite liste d'approbation en un tableau (FUTU) par lequel ledit trajet d'approbation est déterminé et utilisé en conséquence pour surveiller l'envoi et le traitement dudit formulaire rempli.

2. Système selon la revendication 1 comprenant en outre un cinquième moyen d'ordinateur commandé par logiciel répondant aux données lues afin de générer une liste supplémentaire d'accès affectés aux utilisateurs aux données de document correspondantes sur une base de lecture seule, et un moyen de mémorisation destiné à mémoriser ladite liste supplémentaire en un tableau (DONE).

3. Système selon la revendication 2, comprenant en outre :

un moyen d'affichage pour afficher ledit tableau FUTU de l'utilisateur émetteur du document,

un sixième moyen d'ordinateur commandé par logiciel répondant auxdites règles mémorisées afin d'autoriser ledit utilisateur émetteur à vérifier et modifier ladite table FUTU, et

un septième moyen d'ordinateur commandé par logiciel destiné à initialiser le processus d'approbation de document après exécution de ladite vérification.

4. Système selon la revendication 3, dans lequel ledit moyen d'initialisation du processus d'approbation du document comprend :

un huitième moyen d'ordinateur commandé par logiciel destiné à charger le premier approbateur dans la table FUTU à l'intérieur d'un tableau NEXWAIT prémémorisé et à charger le contenu restant du tableau FUTU à l'intérieur d'un tableau NEXTFUTU prémémorisé, et

un neuvième moyen d'ordinateur commandé par logiciel répondant au contenu du tableau NEXWAIT afin d'envoyer un message prédéfini à la machine virtuelle de l'approbateur correspondante.

5. Système selon la revendication 4, comprenant :

un dixième moyen d'ordinateur commandé par logiciel destiné à décharger ledit tableau DONE à l'intérieur d'un tableau NEXTDONE prémémorisé compris dans une machine d'utilisateur de machine virtuelle, et

un onzième moyen d'ordinateur commandé par logiciel pour décharger les tableaux NEXTFUTU, NEXTWAIT et NEXTDONE d'utilisateur dans des tableaux SQL prémémorisés APPFUTU, APPWAIT et APPDONE respectivement.

6. Système selon la revendication 5, dans lequel ledit moyen destiné à gérer les approbations appropriées comprend :

un moyen pouvant être commandé par un terminal d'utilisateur afin de demander l'accès aux tableaux SQL du système,

un moyen pouvant être commandé par le système destiné à accéder au tableau de fonctions mémorisées, à comparer l'identification de l'utilisateur de terminal à celle de l'approbateur tel que mémorisée dans lesdits tableaux de fonctions et, après une vérification positive, décharger le contenu des champs prédéfinis des tableaux SQL APPFUTU, APPWAIT et APPDONE dans les tableaux de machine virtuelle d'utilisateur FUTU, WAIT et DONE respectivement,

un moyen pouvant être commandé par le système répondant audit contenu des tableaux de machine de l'utilisateur pour afficher les données présélectionnées à partir de documents attendant ladite approbation d'utilisateur,

un moyen pouvant être commandé par le terminal d'utilisateur afin de sélectionner l'un desdits documents par lequel ledit document choisi se trouve affiché audit utilisateur, et

un moyen pouvant être commandé par terminal afin que ledit utilisateur insère sa décision d'approbation ou de désapprobation (signature) à l'intérieur d'un champ prédéfini du document.

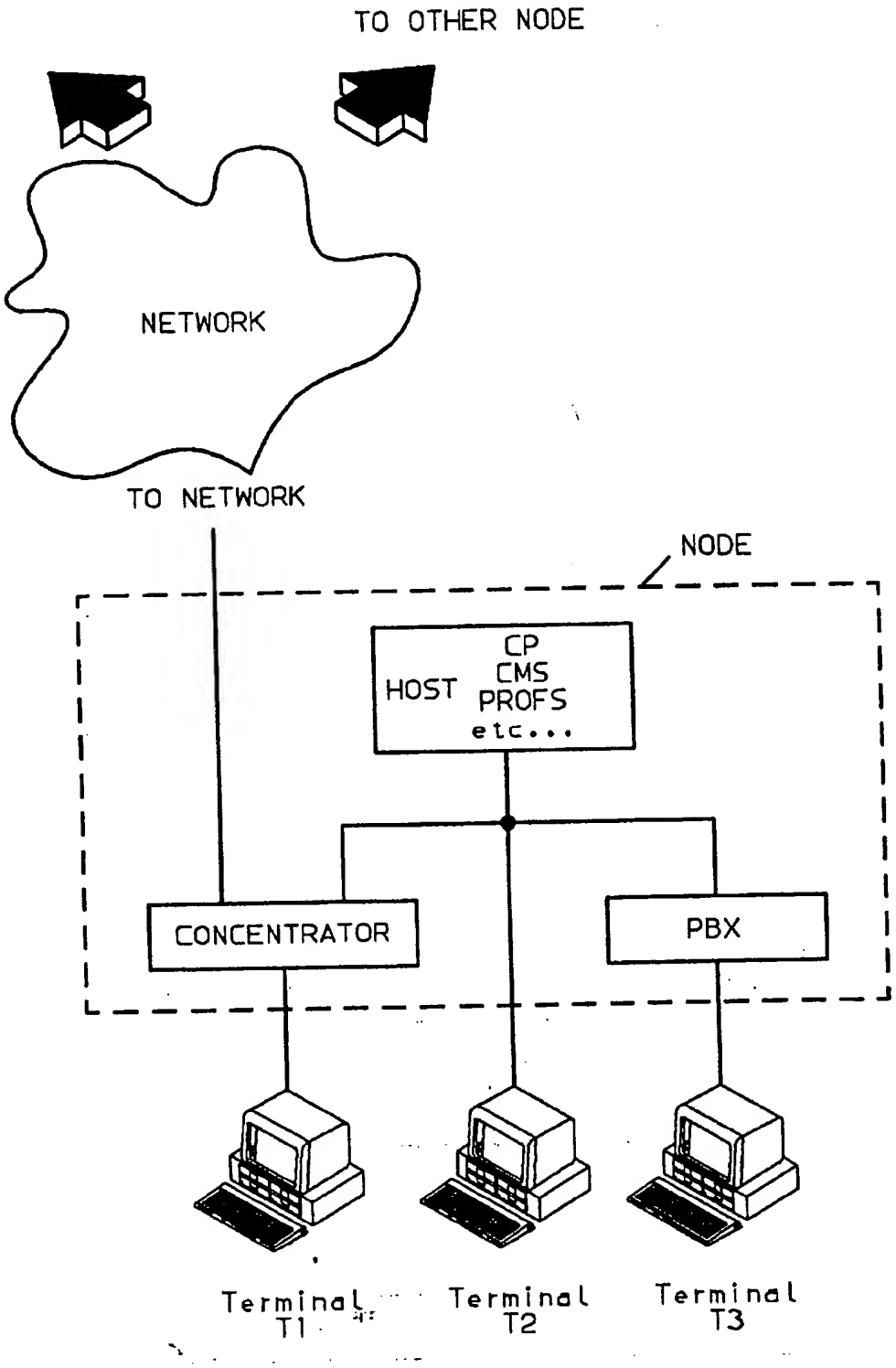
7. Système selon la revendication 6, dans lequel ledit moyen destiné à insérer la décision de l'utilisateur comprend un moyen de validation (approbation) de décision commandé par le système et, après une vérification de validité positive en corrélation, un moyen répondant audit moyen de validation afin d'écrire la décision de l'utilisateur dans un tableau SQL APPDONE accessible autrement sur une base de lecture seulement.

8. Système selon la revendication 7, dans lequel ledit moyen de validation d'approbation comprend un moyen d'ordinateur commandé par logiciel destiné à récupérer un ordre SQL prémémorisé du système et un moyen répondant audit ordre pour déclencher ladite vérification de validité d'approbation.

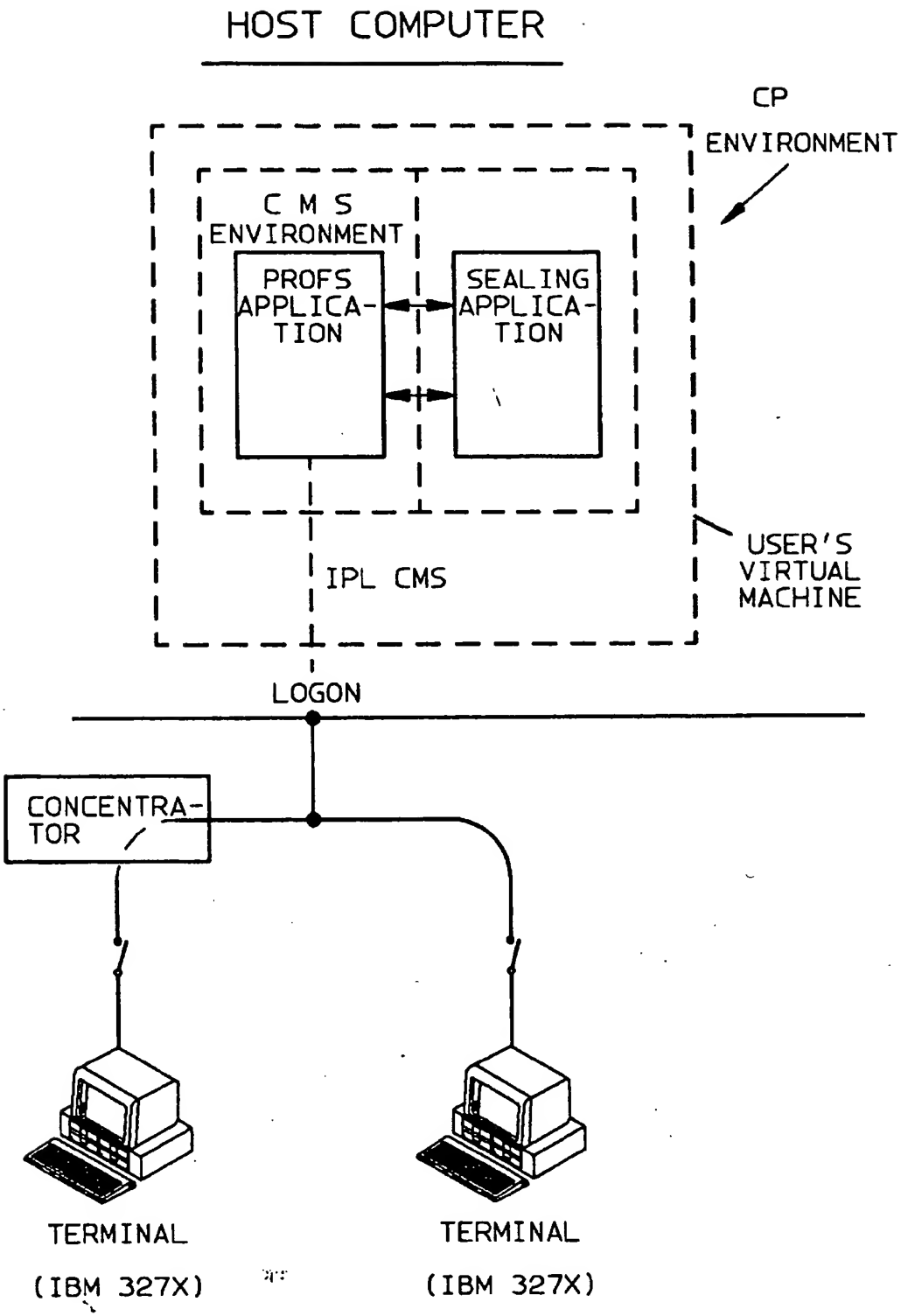
9. Système selon la revendication 8, dans lequel ledit moyen de validation d'approbation comprend :

un moyen d'ordinateur commandé par logiciel destiné à adresser le tableau de système APPWAIT et à vérifier la présence du document considéré dans celui-ci, et

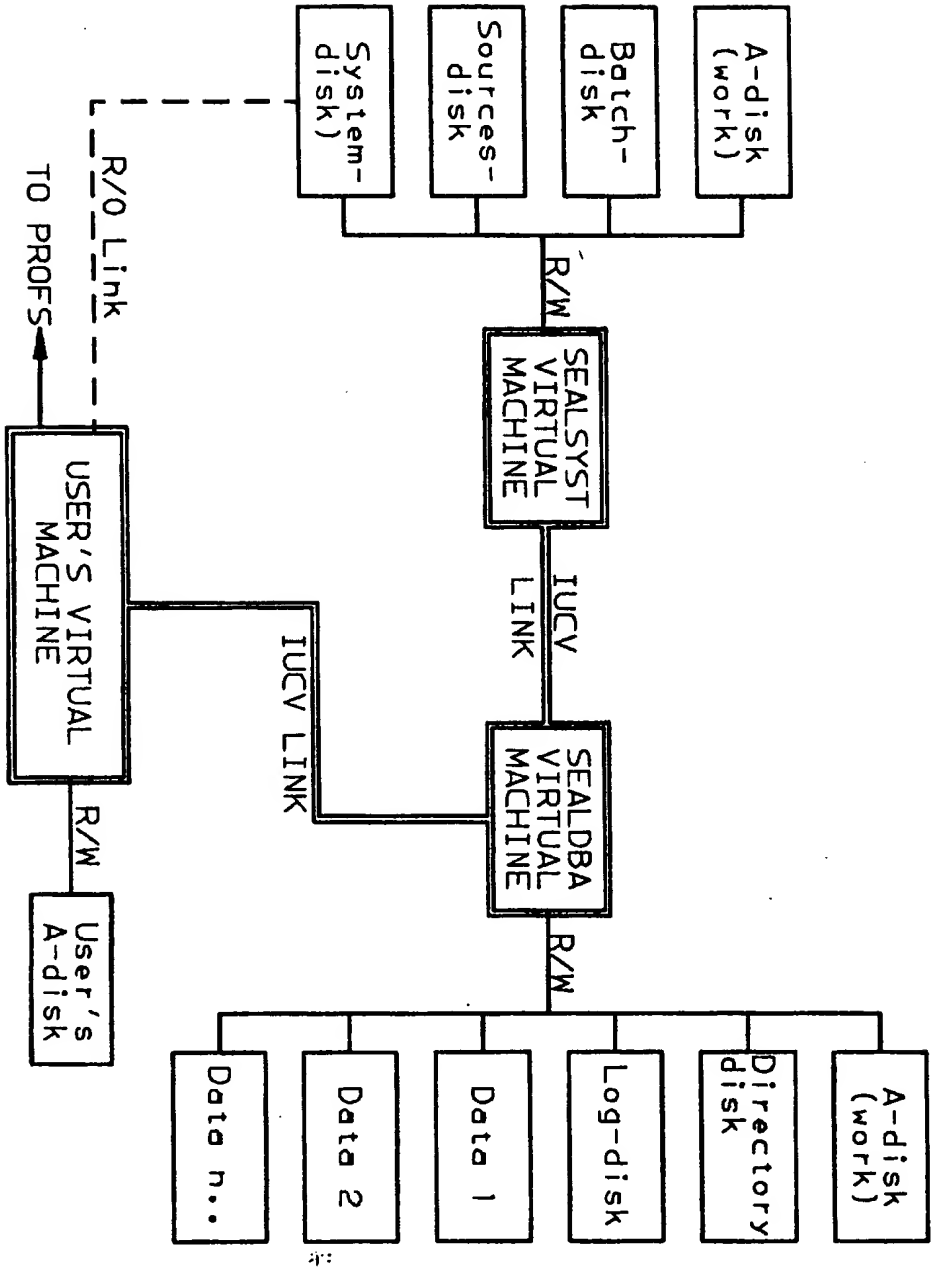
un moyen d'ordinateur commandé par logiciel destiné à adresser le tableau APPWAIT de données et de fonctions du document en attente pour vérifier la correspondance avec l'identification active de l'utilisateur.


TO OTHER NODE
NETWORK
TO NETWORK
NODE
CP
CMS
HOST PROFS
etc...
CONCENTRATOR
PBX
Terminal T1
Terminal T2
Terminal T3

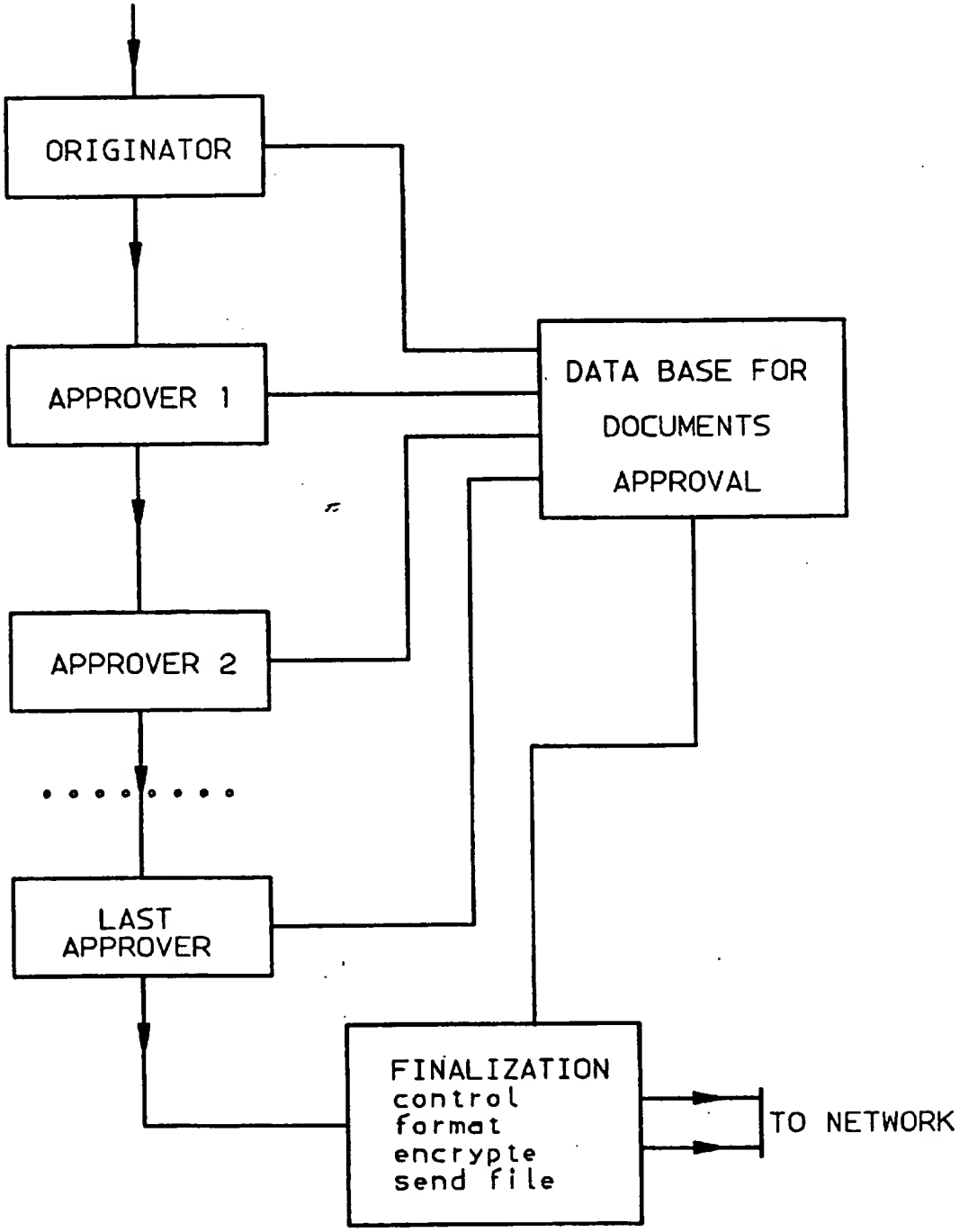
- FIGURE 1 -


HOST COMPUTER
CP
ENVIRONMENT
C M S
ENVIRONMENT
PROFS
APPLICA-
TION
SEALING
APPLICA-
TION
USER'S
VIRTUAL
MACHINE
IPL CMS
LOGON
CONCENTRA-
TOR
TERMINAL
(IBM 327X)
TERMINAL
(IBM 327X)

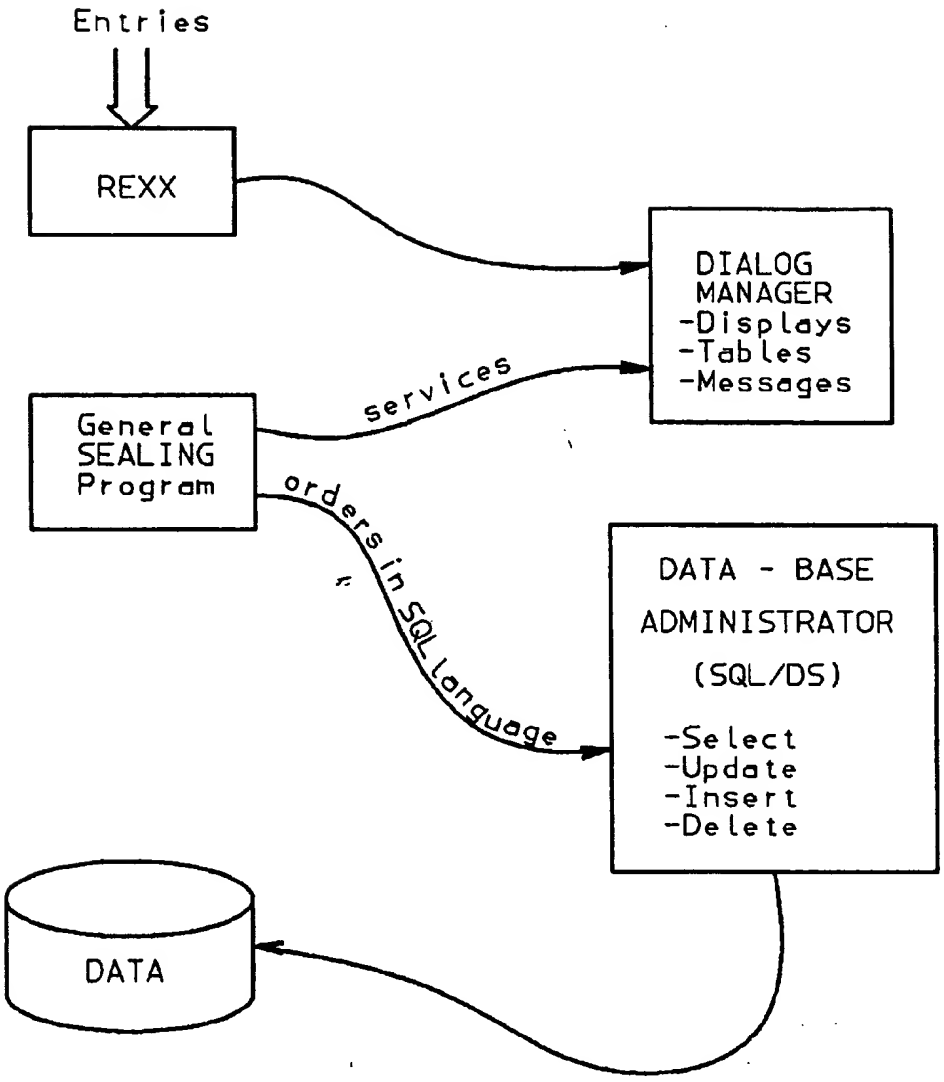
- FIGURE 2 -


A-disk (work)
Batch-disk
Sources-disk
System-disk)
R/W
SEALSYST VIRTUAL MACHINE
IUCV LINK
SEALDBA VIRTUAL MACHINE
R/W
A-disk (work)
Directory disk
Log-disk
Data 1
Data 2
Data n..
IUCV LINK
USER'S VIRTUAL MACHINE
R/W
User's A-disk
R/O Link
TO PROFS

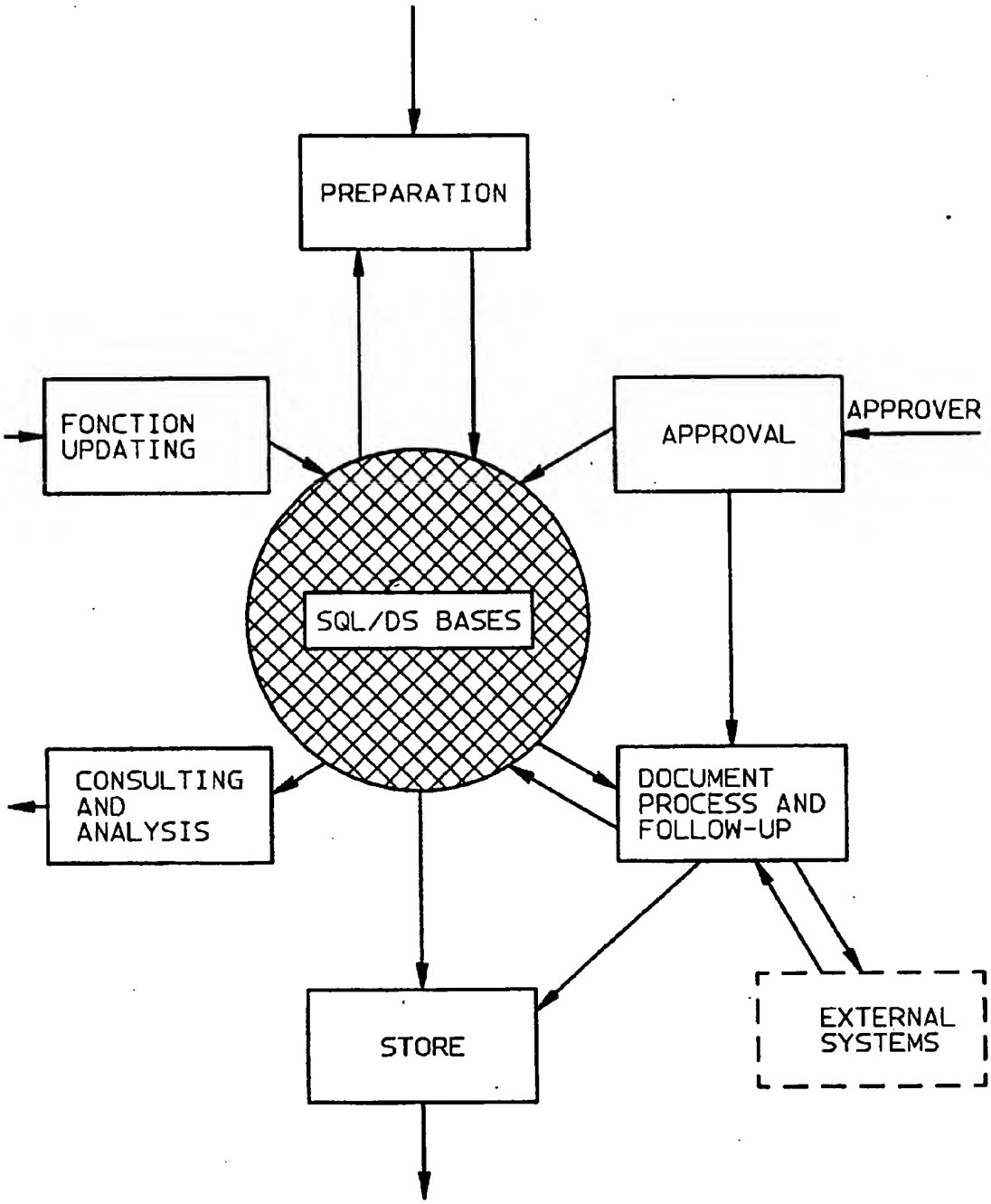
- FIGURE 3 -


ORIGINATOR
APPROVER 1
APPROVER 2
LAST APPROVER
DATA BASE FOR DOCUMENTS APPROVAL
FINALIZATION
control
format
encrypte
send file
TO NETWORK

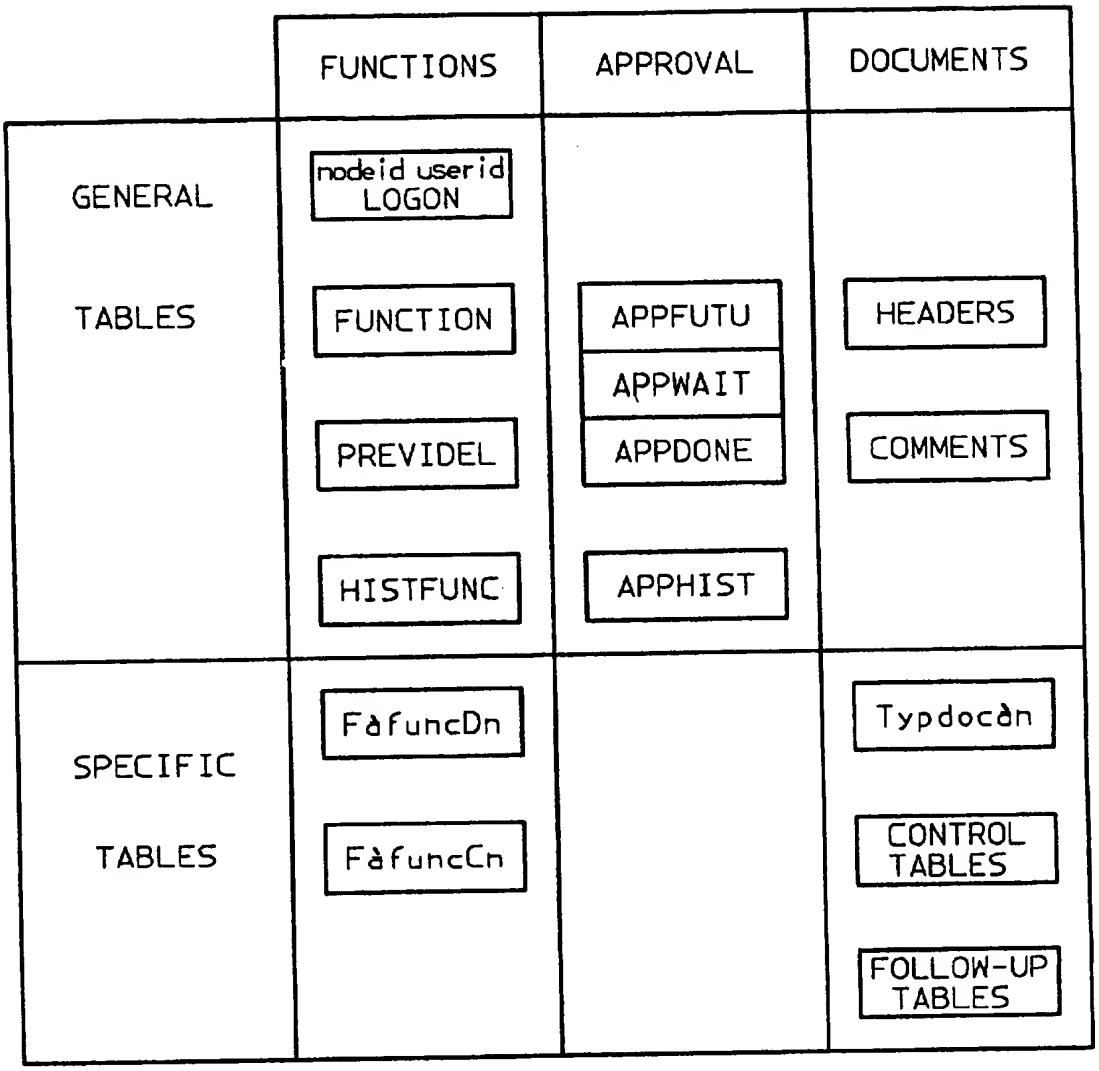
- FIGURE 4 -


Entries
REXX
DIALOG
MANAGER
-Displays
-Tables
-Messages
services
General
SEALING
Program
orders in SQL language
DATA - BASE
ADMINISTRATOR
(SQL/DS)
-Select
-Update
-Insert
-Delete
DATA

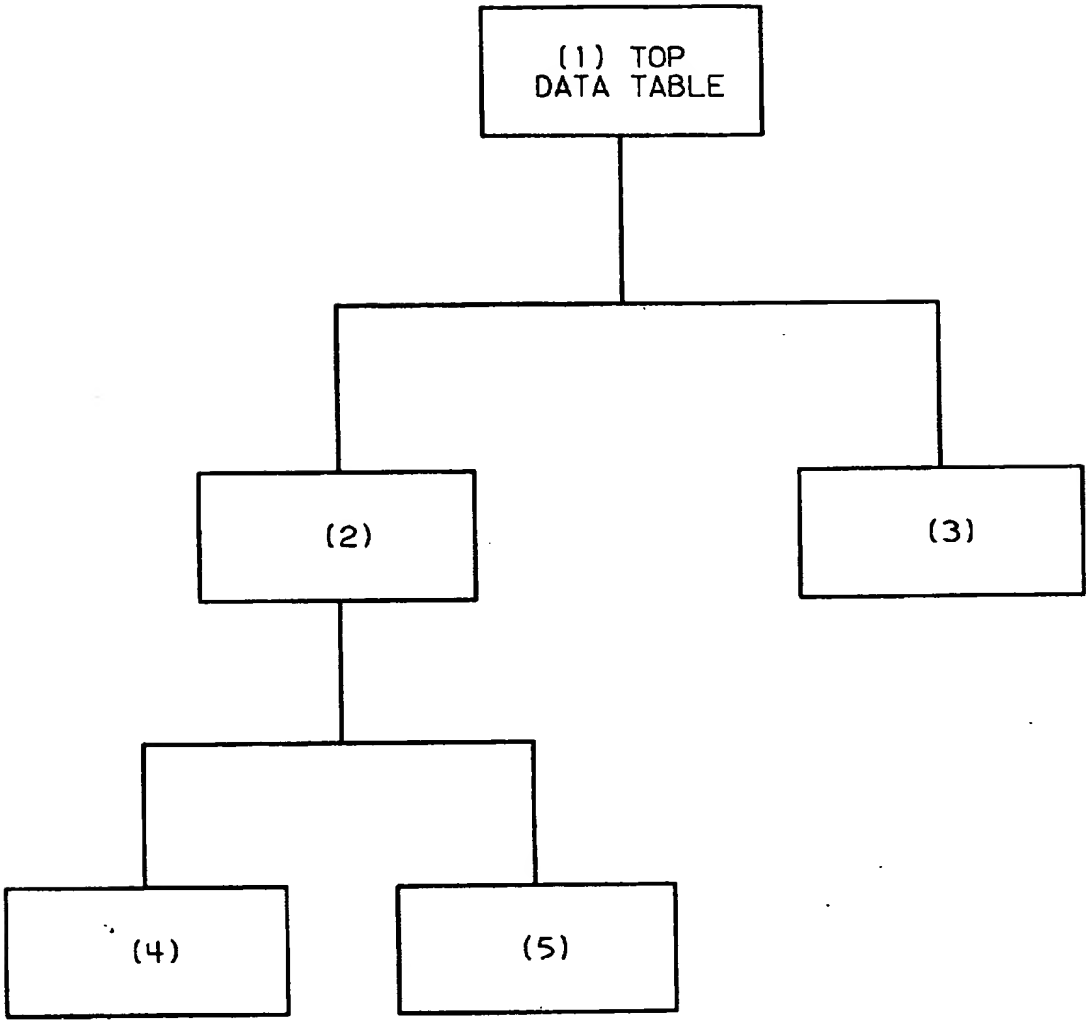
- FIGURE 5 -


PREPARATION
FONCTION UPDATING
APPROVAL
APPROVER
SQL/DS BASES
CONSULTING AND ANALYSIS
DOCUMENT PROCESS AND FOLLOW-UP
STORE
EXTERNAL SYSTEMS

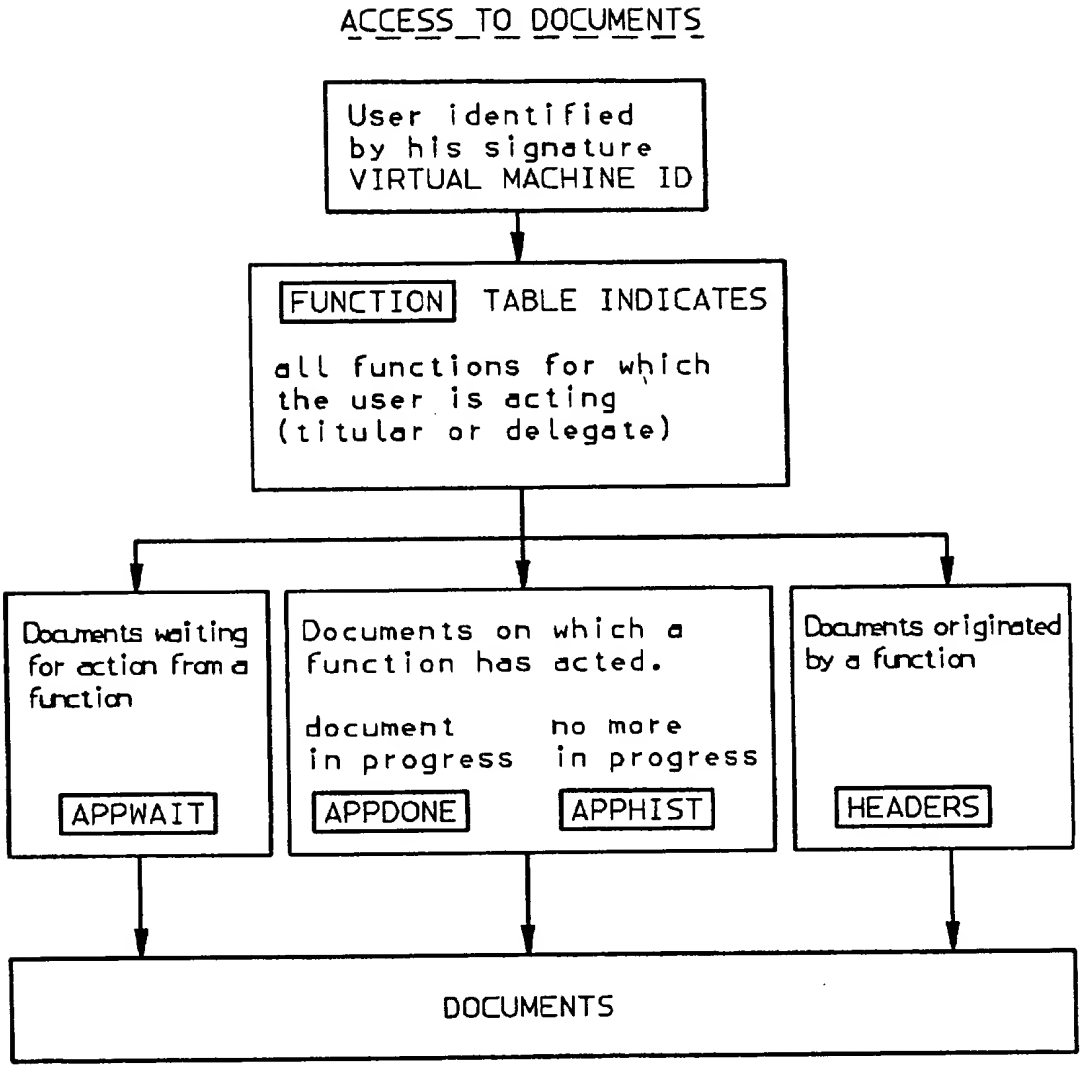
- FIGURE 6-


FUNCTIONS
APPROVAL
DOCUMENTS
GENERAL
TABLES
nodeid userid LOGON
FUNCTION
PREVIDEL
HISTFUNC
APPFUTU
APPWAIT
APPDONE
APPHIST
HEADERS
COMMENTS
SPECIFIC
TABLES
FàfuncDn
FàfuncCn
Typdocàn
CONTROL TABLES
FOLLOW-UP TABLES

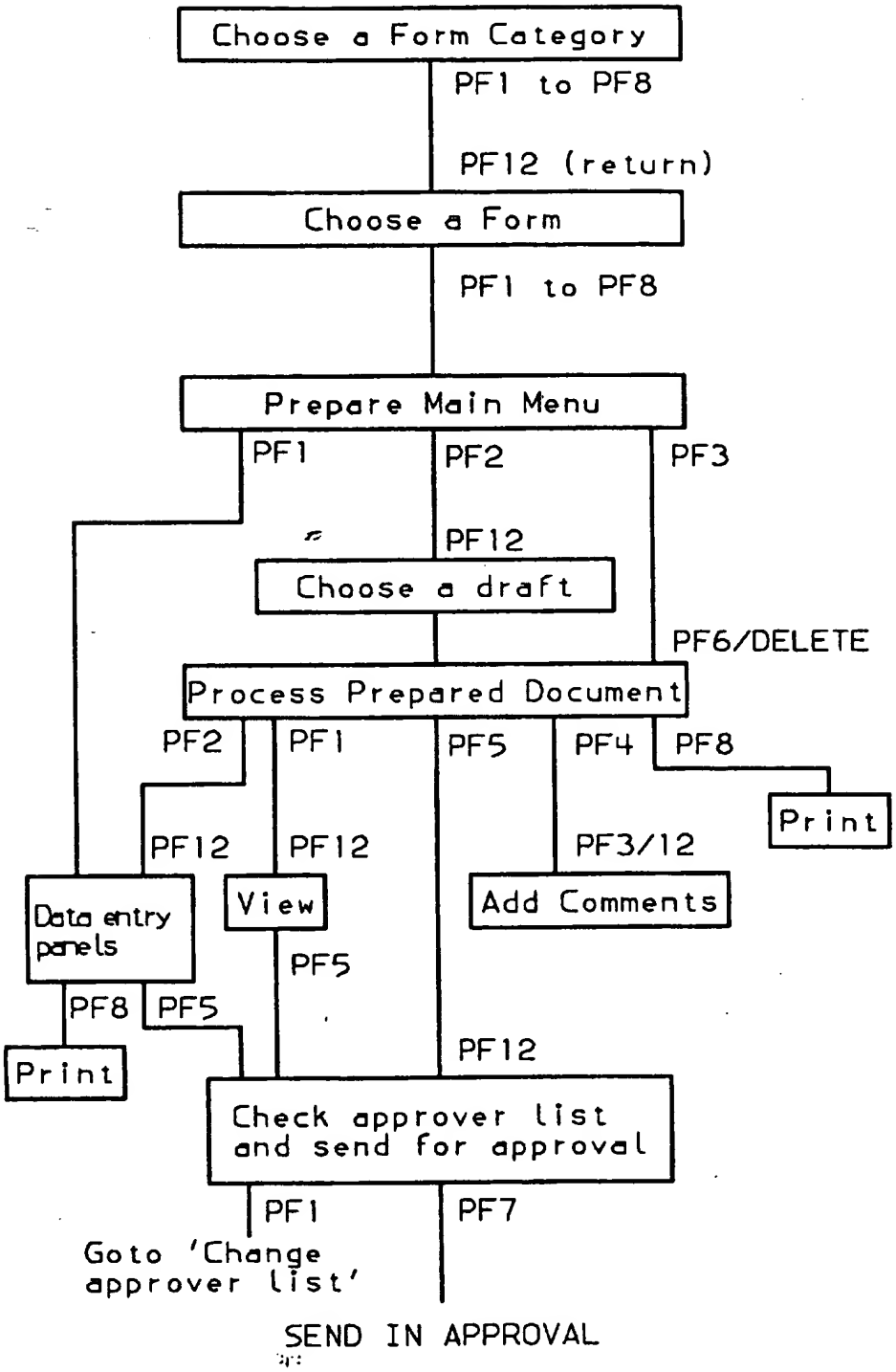
- FIGURE 7-



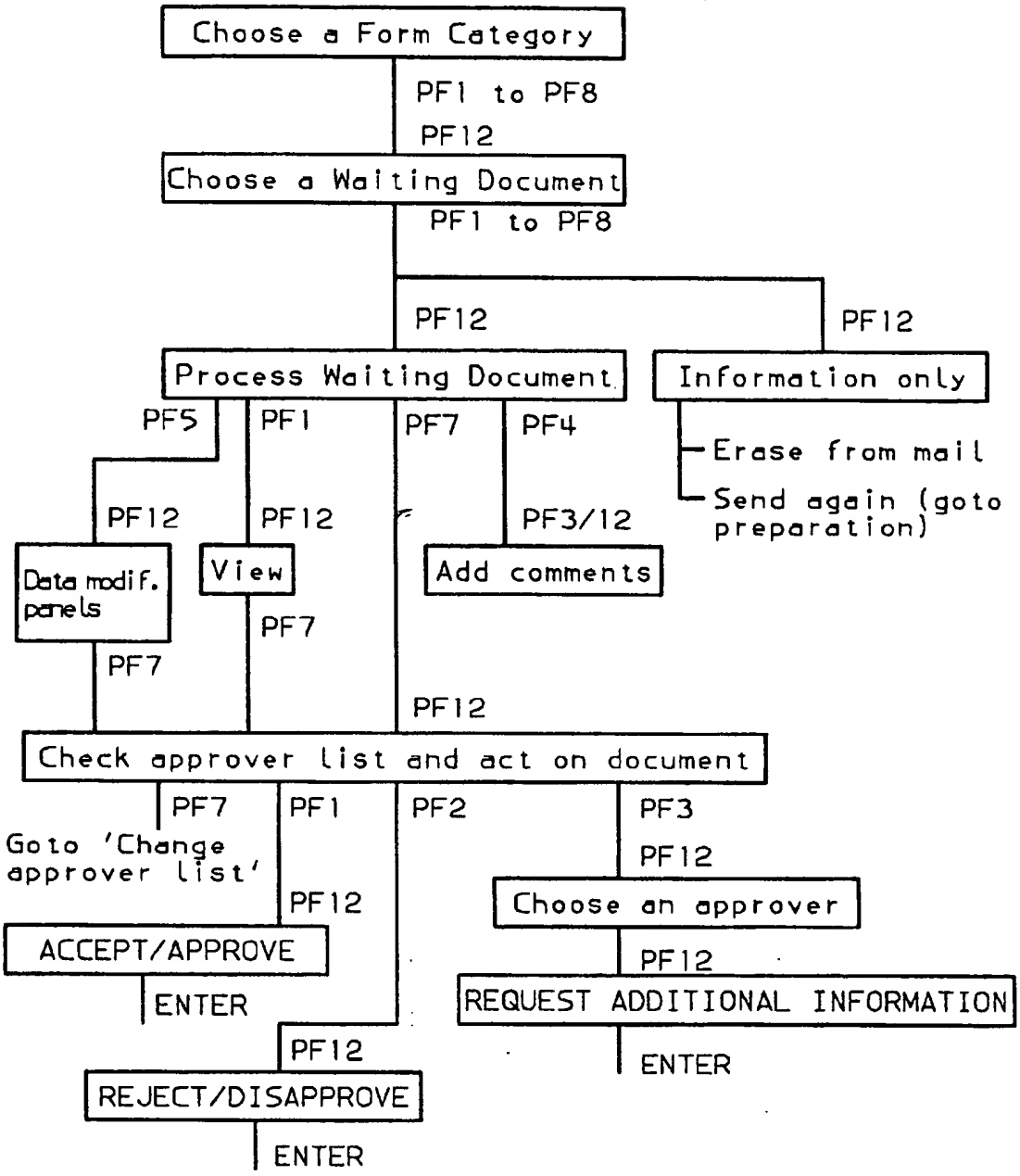
- FIGURE 8-


ACCESS TO DOCUMENTS
User identified
by his signature
VIRTUAL MACHINE ID
FUNCTION TABLE INDICATES
all functions for which
the user is acting
(titular or delegate)
Documents waiting
for action from a
function
APPWAIT
Documents on which a
function has acted.
document
in progress
APPDONE
no more
in progress
APPHIST
Documents originated
by a function
HEADERS
DOCUMENTS

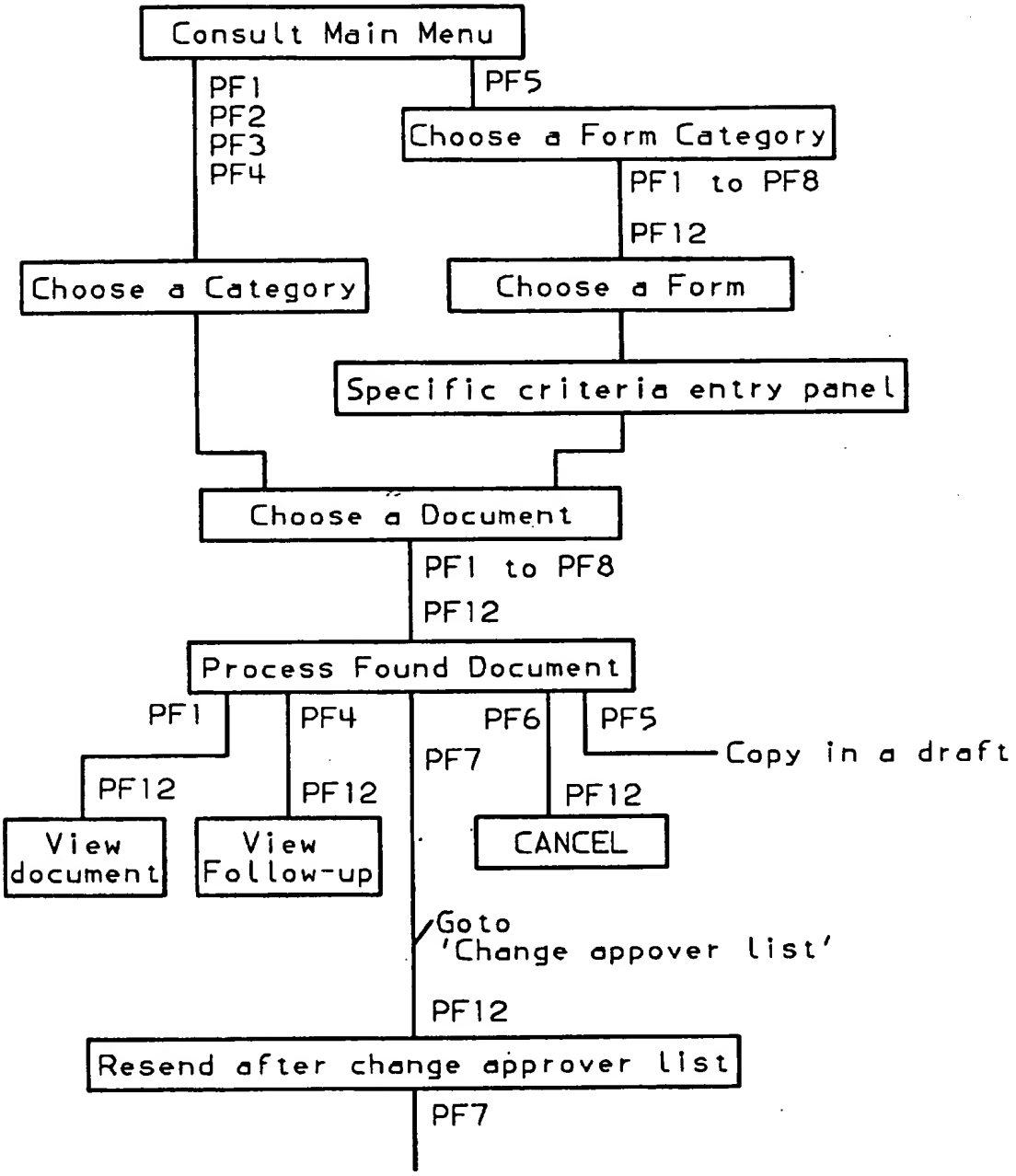
- FIGURE 9-


Choose a Form Category
PF1 to PF8
PF12 (return)
Choose a Form
PF1 to PF8
Prepare Main Menu
PF1
PF2
PF3
PF12
Choose a draft
PF6/DELETE
Process Prepared Document
PF2
PF1
PF5
PF4
PF8
Print
PF12
PF12
PF3/12
Data entry panels
View
Add Comments
PF5
PF8
PF5
Print
PF12
Check approver list and send for approval
PF1
PF7
Goto 'Change approver list'
SEND IN APPROVAL

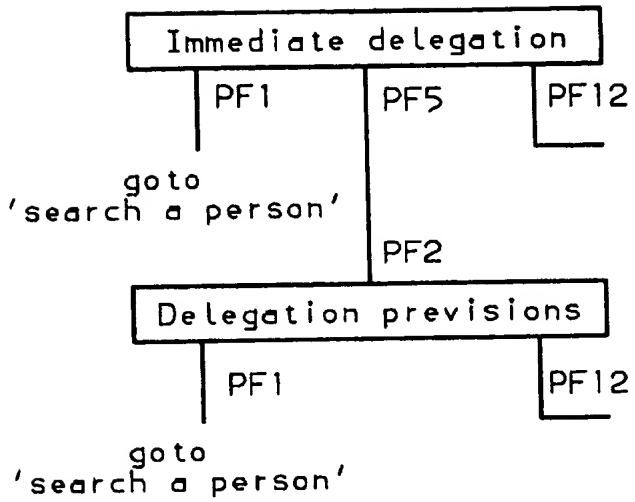
- FIGURE 10-


Choose a Form Category
PF1 to PF8
PF12
Choose a Waiting Document
PF1 to PF8
PF12
PF12
Process Waiting Document
Information only
PF5
PF1
PF7
PF4
Erase from mail
Send again (goto preparation)
PF12
PF12
PF3/12
Data modif. panels
View
Add comments
PF7
PF7
PF12
Check approver list and act on document
PF7
PF1
PF2
PF3
Goto 'Change approver list'
PF12
PF12
Choose an approver
ACCEPT/APPROVE
PF12
ENTER
REQUEST ADDITIONAL INFORMATION
ENTER
PF12
REJECT/DISAPPROVE
ENTER

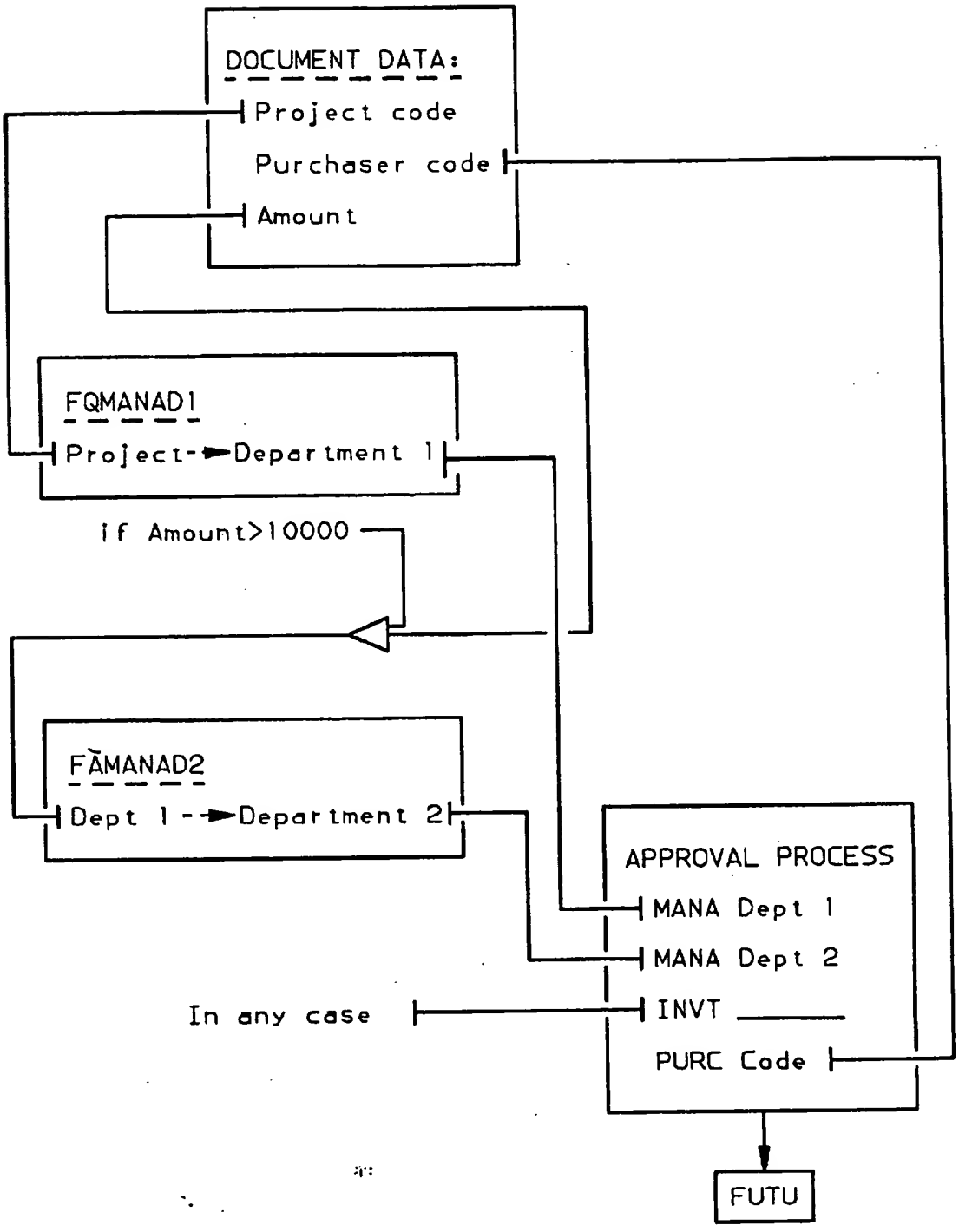
- FIGURE 11-


Consult Main Menu
PF1
PF2
PF3
PF4
PF5
Choose a Form Category
PF1 to PF8
PF12
Choose a Category
Choose a Form
Specific criteria entry panel
Choose a Document
PF1 to PF8
PF12
Process Found Document
PF1
PF4
PF6
PF5
PF7
Copy in a draft
PF12
PF12
PF12
View document
View Follow-up
CANCEL
Goto 'Change appover list'
PF12
Resend after change approver list
PF7

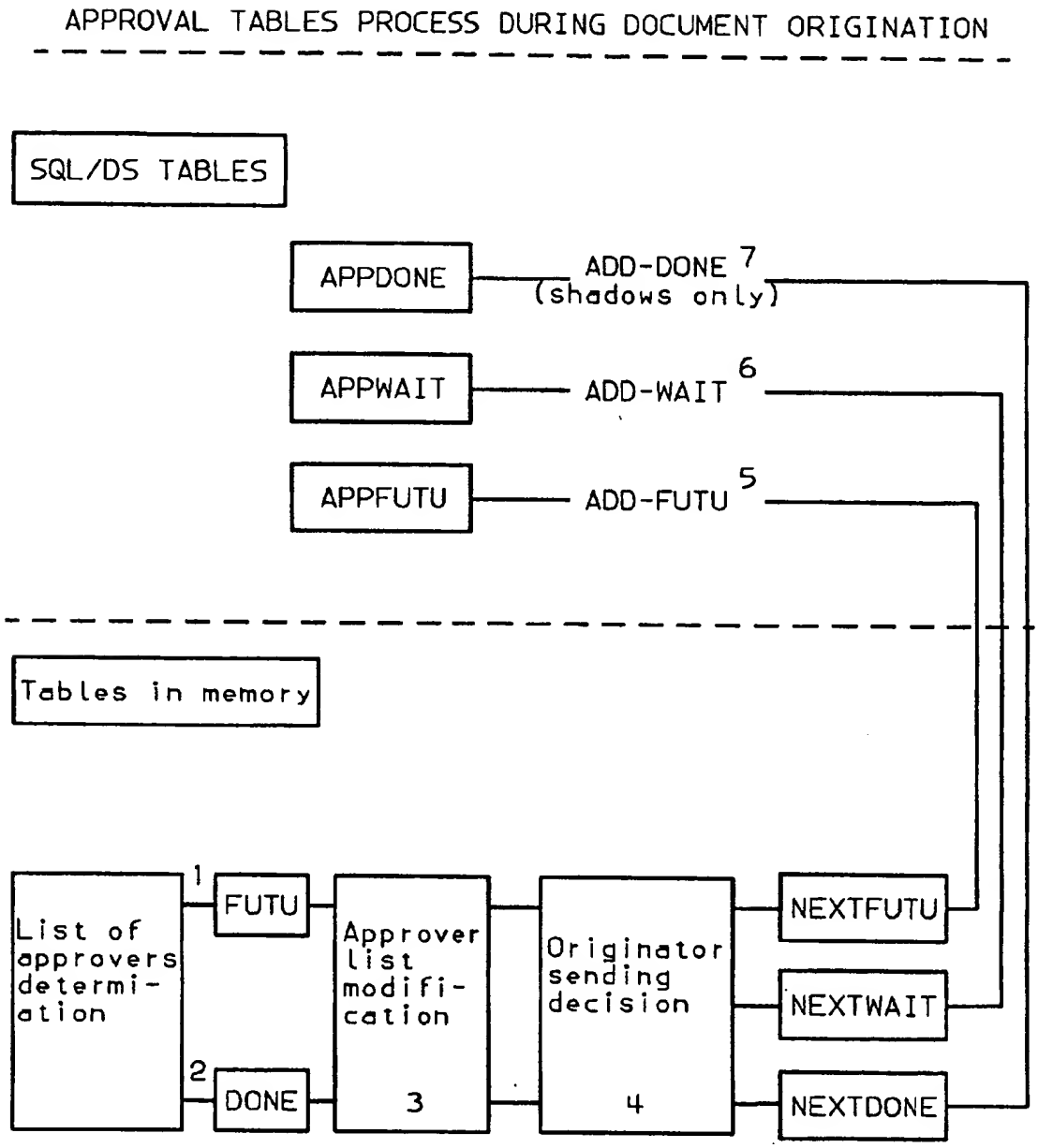
- FIGURE 12-


Immediate delegation
PF1
PF5
PF12
goto
'search a person'
PF2
Delegation previsions
PF1
PF12
goto
'search a person'

- FIGURE 13-

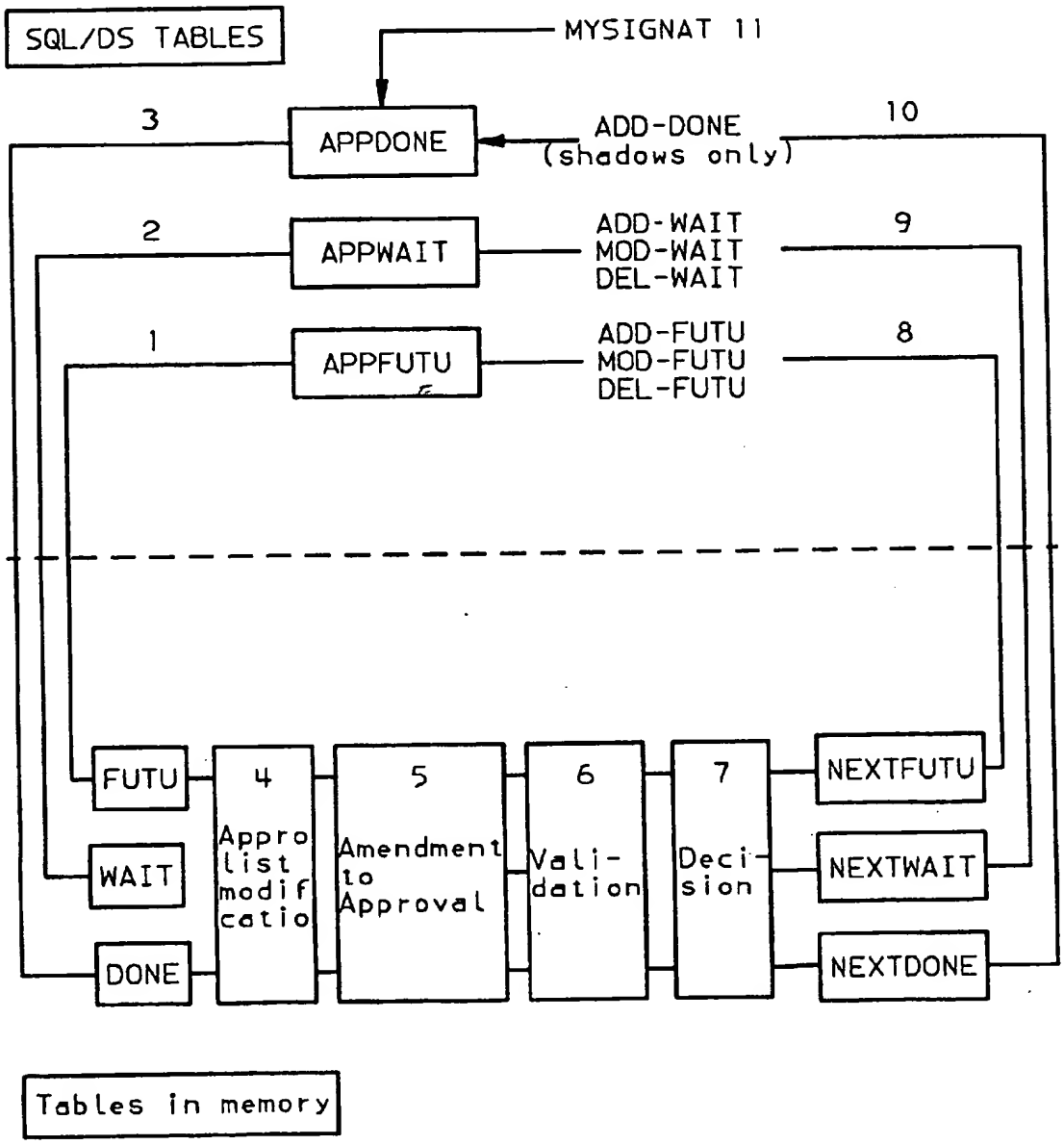

DOCUMENT DATA:
Project code
Purchaser code
Amount
FQMANAD1
Project-►Department 1
if Amount>10000
FAMANAD2
Dept 1-►Department 2
APPROVAL PROCESS
MANA Dept 1
MANA Dept 2
In any case
INVT
PURC Code
FUTU

- FIGURE 14 -

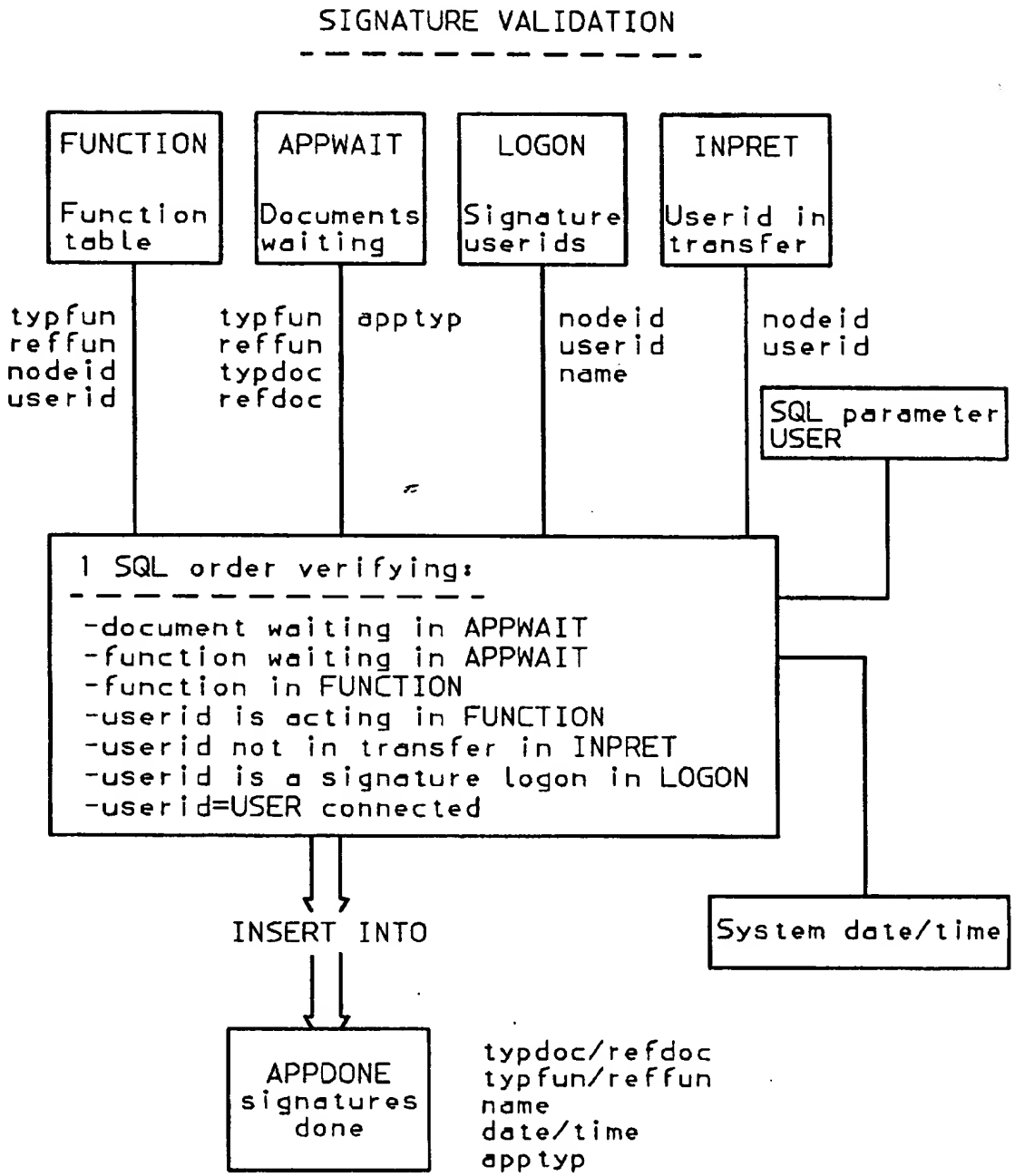

APPROVAL TABLES PROCESS DURING DOCUMENT ORIGINATION
SQL/DS TABLES
APPDONE
ADD-DONE 7
(shadows only)
APPWAIT
ADD-WAIT 6
APPFUTU
ADD-FUTU 5
Tables in memory
List of approvers determi-ation
1
FUTU
2
DONE
Approver list modifi-cation
3
Originator sending decision
4
NEXTFUTU
NEXTWAIT
NEXTDONE

- FIGURE 15 -

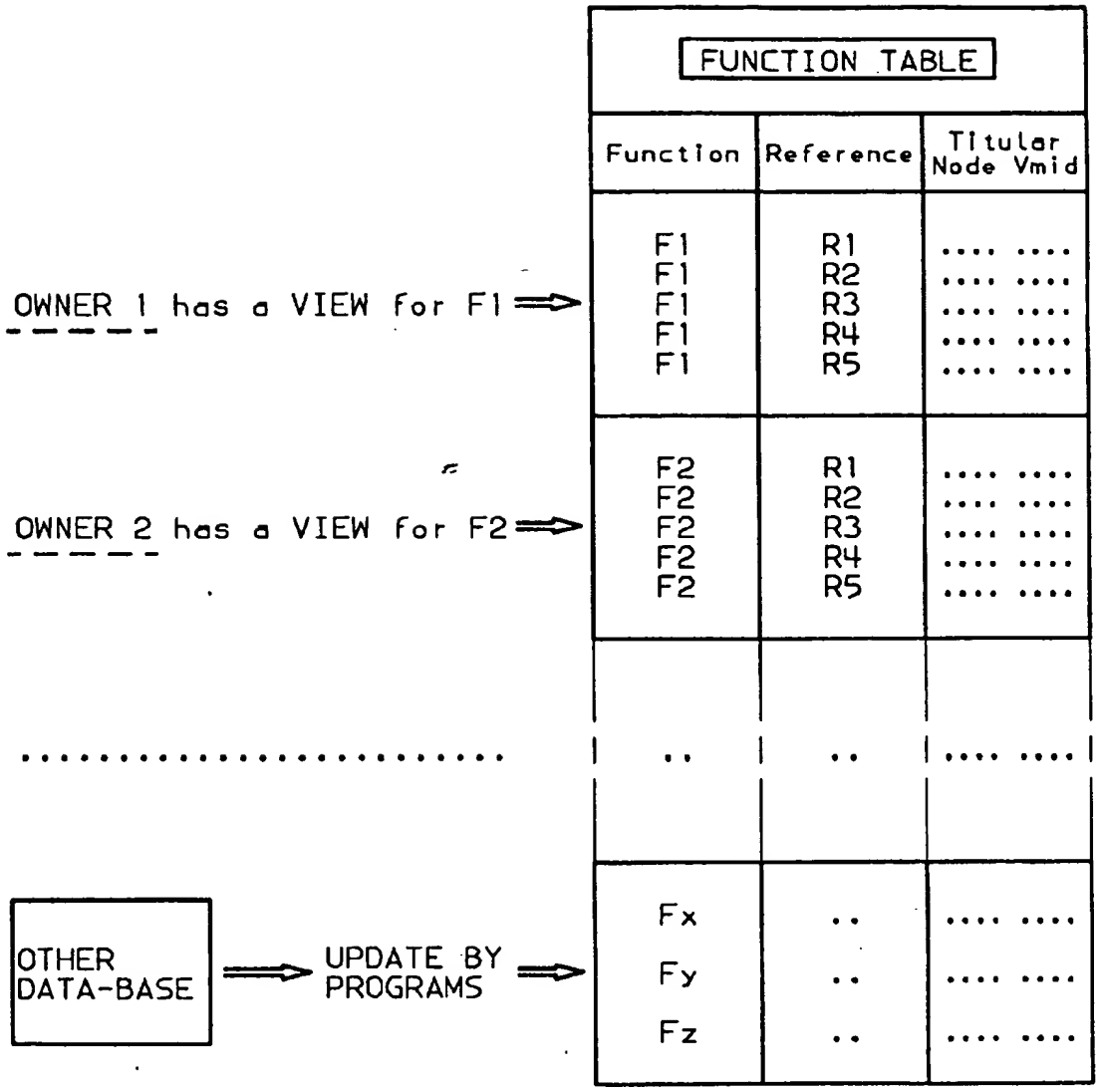
APPROVAL TABLES PROCESS DURING APPROVER'S ACTION



- FIGURE 16 -


SIGNATURE VALIDATION
FUNCTION
Function table
APPWAIT
Documents waiting
LOGON
Signature userids
INPRET
Userid in transfer
typfun
reffun
nodeid
userid
typfun
reffun
typdoc
refdoc
apptyp
nodeid
userid
name
nodeid
userid
SQL parameter
USER
1 SQL order verifying:
-document waiting in APPWAIT
-function waiting in APPWAIT
-function in FUNCTION
-userid is acting in FUNCTION
-userid not in transfer in INPRET
-userid is a signature logon in LOGON
-userid=USER connected
INSERT INTO
System date/time
APPDONE
signatures done
typdoc/refdoc
typfun/reffun
name
date/time
apptyp

- FIGURE 17 -


FUNCTION TABLE
Function
Reference
Titular Node Vmid
OWNER 1 has a VIEW for F1
F1 R1 ....
F1 R2 ....
F1 R3 ....
F1 R4 ....
F1 R5 ....
OWNER 2 has a VIEW for F2
F2 R1 ....
F2 R2 ....
F2 R3 ....
F2 R4 ....
F2 R5 ....
.....
.. ..
OTHER DATA-BASE
UPDATE BY PROGRAMS
Fx .. ..
Fy .. ..
Fz .. ..

- FIGURE 18 -

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